A Collaborative Research Project Funded by:

DFID Department for International Development

Implemented by:

HPAI PRO-POOR HPAI RISK REDUCTION

Pro-Poor HPAI Risk Reduction Strategies in Ghana —Background Paper

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Africa/Indonesia Team Working Paper No. 2

Table of Contents

Page

List of Tables

List of Figures

List of Appendices

Preface

Since its re-emergence, HPAI H5N1 has attracted considerable public and media attention because the viruses involved have been shown to be capable of producing fatal disease in humans. While there is fear that the virus may mutate into a strain capable of sustained human-to-human transmission, the greatest impact to date has been on the highly diverse poultry industries in affected countries. In response to this, HPAI control measures have so far focused on implementing prevention and eradication measures in poultry populations, with more than 175 million birds culled in Southeast Asia alone.

Until now, significantly less emphasis has been placed on assessing the efficacy of risk reduction measures, including their effects on the livelihoods of smallholder farmers and their families. In order to improve local and global capacity for evidence-based decision making on the control of HPAI (and other diseases with epidemic potential), which inevitably has major social and economic impacts, the UK Department for International Development (DFID) has agreed to fund a collaborative, multidisciplinary HPAI research project for Southeast Asia and Africa.

The specific purpose of the project is to aid decision makers in developing evidence-based, pro-poor HPAI control measures at national and international levels. These control measures should not only be cost-effective and efficient in reducing disease risk, but also protect and enhance livelihoods, particularly those of smallholder producers in developing countries, who are and will remain the majority of livestock producers in these countries for some time to come.

This report is the first step of the project which has compiled and assessed the current state of knowledge of poultry systems and their place in the larger economy of the study country, the current HPAI situation and its evolution, and institutional experiences with its control (or, where it has not taken place, contingency places should it arise). This information has been written by a multidisciplinary national team in the study country highlighting the current knowledge and knowledge gaps related to the interface of poultry, HPAI, and institutional response as a crucial first step to the analytical research outputs to be generated in the course of this project. In the process of writing the background paper a variety of country-specific data and information sources on poultry systems, HPAI, and mitigation/control efforts, including published and grey literature, national statistics, journal articles, and reports from other research efforts that are ongoing in the country have been complied into a data base located at the project web site http://www.hpai-research.net/index.html.

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Disclaimer

Acknowledgements

The authors and the international project team are grateful to the Veterinary Services Department, Ministry of Food and Agriculture for their fruitful collaboration in this project and in the finalization of this report. We are especially indebted to Dr. Enoch Boye-Mensah Koney, the Director of the Veterinary Services Department and to Dr. Anthony Nsoh Akunzule for their valuable feedback and suggestions on this report.

More information

For more information about the project please refer to www.hpai-research.net.

Abbreviations and Acronyms

ADB	-	Agricultural Development Bank (Ghana)
AIWG	-	Avian Influenza Working Group
ASF	-	African Swine Fever
CEPS	-	Customs and Excise Preventive Services
DFID	-	Department for International Development (UK)
ECOWAS	-	Economic Community of West African States
EDIF	-	Export Development Investment Fund
FAO	-	Food and Agriculture Organization of the United Nations
FASDEP	-	Food and Agriculture Sector Development Project
GLSS	-	Ghana Living Standards Survey
GNAPF	-	Ghana National Association of Poultry Farmers
GDP	-	Gross Domestic Product
GSS	-	Ghana Statistical Services
HDI	-	Human Development Index
HPAI	-	Highly Pathogenic Avian Influenza
ISSER	-	Institute of Statistical, Social and Economic Research
LPIU	-	Livestock Planning and Information Unit
MOFA	-	Ministry of Food and Agriculture (Ghana)
MOTI	-	Ministry of Trade and Industries
NGOs	-	Non-Governmental Organisations
NHIS	-	National Health Insurance Service
UNDP	-	United Nations Development Programme
UNICEF	-	United Nations Children's Fund
VSD	-	Veterinary Services Directorate

Executive Summary

This study presents a detailed review of the poultry sector in Ghana with an aim to provide in depth information on the linkages in the production chain and the role of the poultry sector in the national economy. Information on the history and current status of the Highly Pathogenic Avian Influenza (HPAI) and the institutional experiences in the prevention and control of recent outbreaks are also reviewed. Published and grey literature, various reports and official documents were used in the preparation of this review.

Another objective of this study is to provide information to assist the formulation of national and international strategies for minimizing the impacts of HPAI outbreaks and threats, especially on the livelihoods of resource-poor smallholder farmers.

Livelihood patterns and strategies in Ghana are typically linked to the ecological zones with livestock keeping, rain-fed and subsistence agriculture being key elements. Village poultry constitute the largest sub-sector, comprising some 25 million free-roaming and scavenging chickens, guinea fowls, ducks and turkeys owned by 66% of the 3.7 million households in Ghana. These poultry are kept for cash and food, and marketed at farm gate or in wet markets by retailers. The major constraints to village chicken rearing are predation and Newcastle Disease, against which the I2 vaccination programme was already introduced.

Commercial production (with exotic breeds) is categorized as large scale (industrial), medium scale and small-scale producers. Large scale producers are largely integrated with their own hatcheries, feed mills, processing units and marketing outlets. There are currently five such large scale, industrial farms in Ghana.

The medium and small-scale producers depend on the industrial farms for day-old chicks (DOC), feed and sometimes broiler bird processing. They are also supplied by either commercial feed millers or importers of DOC and veterinary drugs and feed supplements.

Processing of broilers is limited to whole, frozen birds, although there is an emerging trend towards further processing into sausages, nuggets and other value-added products. While broiler production is on the decline, as a result of competition with cheaper imported frozen poultry meat, egg production is showing an increasing trend. Across all the poultry production systems biosecurity is poor, however vaccination programmes against various poultry diseases have generally been effective.

The major countries exporting poultry meat to Ghana include Brazil, the United States of America, and the member countries of the European Union. Together these account for 75% of the total poultry imports. Imported poultry products are usually sold through well organized, cold chains present in the cities and other urban centres.

The three outbreaks of HPAI in Ghana were effectively controlled by the Veterinary Services Directorate, with support from donor agencies, and co-ordination of the Avian Influenza Working Group. Information on the symptoms and risks of HPAI was made available to the public through the local media, workshops, pamphlets, skits and sketches. The government compensated those farmers whose birds were culled. However, it is envisaged that the future compensation payments

will be linked to the level of biosecurity (or the lack of it). Ghana is still in a state of high alert due to the circulation of the HPAI virus in West Africa.

1. Introduction

The agro-ecological zone in the majority of the northern half of the country is characterized as Guinea Savanna. This zone extends over the three northern Administrative regions: Northern, Upper East and Upper West and northern portion of the Volta Region (Figures 1.1 and 1.2). This zone constitutes 63% of the land area in Ghana, has an annual mean rainfall of 1,100 mm, supports mainly the cultivation of grains and is home to most of the livestock population of the country (SRID, 2001; MOFA 2004).

The rest of the country (with the exception of a coastal strip of Savanna) extending from the Southernmost part of the Western Region to the Southern part of the Volta Region at the Eastern border of the country is characterized by four agro-ecological zones: rainforest, deciduous forest, a transitional zone between the forest areas and Guinea Savanna and Coastal Savanna. The rainforest zone covers 3% of the total land area, with a mean annual rainfall of 2,200 mm, supporting tree and root crops and low level livestock production. Deciduous forest covers 3% of the land area and has a mean annual rainfall of 1,500mm. The transitional zone covers 28% of the total land area, has a mean annual rainfall of 1,300 mm and supports intensive food crops cultivation. The Coastal Savanna covers the remaining 2% of Ghana's total land area, with a mean annual rainfall of 800mm. This zone supports cereals, vegetable and cassava production, as well as a moderate level of livestock production (MOFA, 2004).

The Ghanaian economy is based largely on the agricultural sector, which accounted for 41% of Gross Domestic Product (GDP) in 2005. About 60% of the labour force is engaged in this sector, with the majority engaged in crop farming or mixed crop and livestock/poultry farming. According to a recent survey (MOFA/DFID, 2002), the livestock/poultry component serves as a safety net, providing an important source of ready cash for emergency needs. Thus, even though livestock and poultry contribute only 7% to the agricultural GDP (FASDEP, 2002) their role in rural livelihoods and food and nutrition security is significant.

In the 1960s, the Government identified poultry production to have the greatest potential for addressing acute shortfall in the supply and consumption of animal protein in Ghana (Gyening, 2006). Various government interventions were implemented to establish commercial poultry projects in Ghana and private sector initiatives in commercial poultry production were encouraged (Aning, 2006). Local commercial production however, has lagged behind demand, mainly due to high costs of inputs such as feed, and the substantially lower prices of imported substitutes (Aning, 2006).

Free-range village poultry accounts for 60-80% of the national poultry population (FASDEP, 2002; Gyening, 2006) and was estimated to contain between 12 and 20 million birds between 2000 and 2005 (Amakye-Anim, 2000; FAOSTAT, 2005). Village poultry, which is also called rural poultry interchangeably, is comprised of village chickens, local guinea fowls, ducks, turkeys and pigeons. Even though village poultry are kept all over the country, its production is concentrated in the three northern regions of Ghana (LPIU, 2006) where poverty is endemic. Thus, in these areas rural poultry meets crucial livelihood and nutrition needs (MOFA/DFID, 2002) and any threats to rural poultry production will severely affect farmers' economic well-being.

Newcastle Disease has continued to be the main challenge to village chicken production in Ghana. The Veterinary Services Directorate (VSD) of Ghana has now introduced a control programme based on the use of the Heat Stable Newcastle Disease Virus I2 vaccine, which can be applied by the farmer (Awuni, 2002). The vaccine can be obtained from VSD laboratories in Accra, Kumasi, Techiman and Pong-Tamale, and is available to poor farmers at a token price.

For exotic commercial chickens, Gumboro is an important threat. Vaccines are available from both Government and private veterinary outlets. The main problem with the control of the Gumboro disease has been the vaccination schedule.

The outbreaks of Highly Pathogenic Avian Influenza (HPAI) in the country have occurred on commercial poultry farms in Tema (Greater Accra Region) in April 2007, and later in May in the Brong Ahafo Region. These outbreaks were successfully contained through a policy of slaughter and quarantine, which could not have been effectively applied on village chickens, had the outbreaks spread to those. It is therefore of great importance to identify strategies to control HPAI in local poultry to sustain the livelihoods of rural farmers, and to secure the health of the entire poultry population of Ghana.

The aim of this review is to present background information in greater detail (see Aning, 2006) with a focus on the poultry kept by resource-poor, smallholder farmers to help enable the formulation of strategies that will protect smallholders' livelihoods.

Documents reviewed include published articles, relevant government documents and statistics, consultancy reports, press releases and workshop and conference addresses. Valuable information and data were also gathered through discussions with officials of the Ministry of Food and Agriculture and the Ghana National Association of Poultry Farmers.

Figure 1.1 Regional Map of Ghana

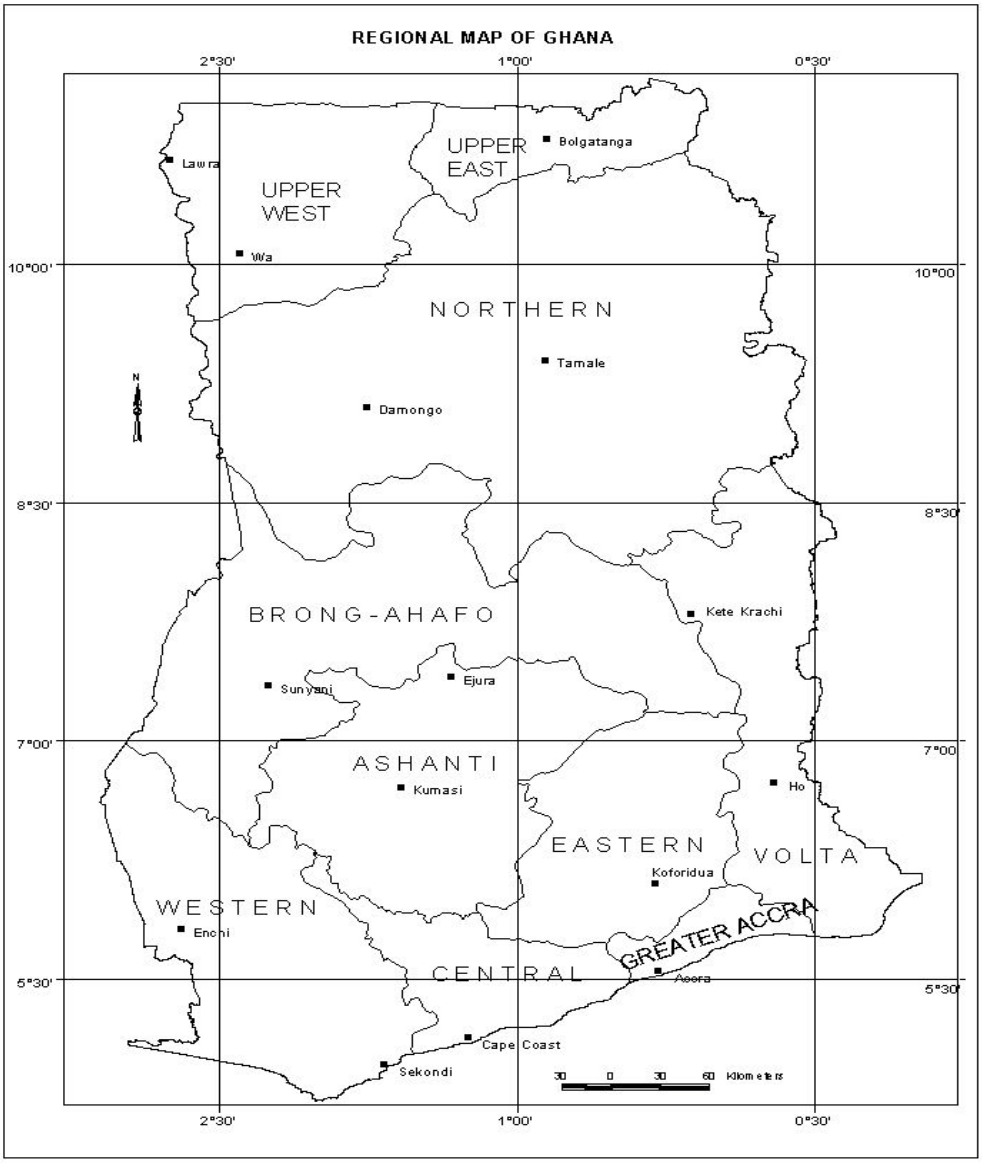
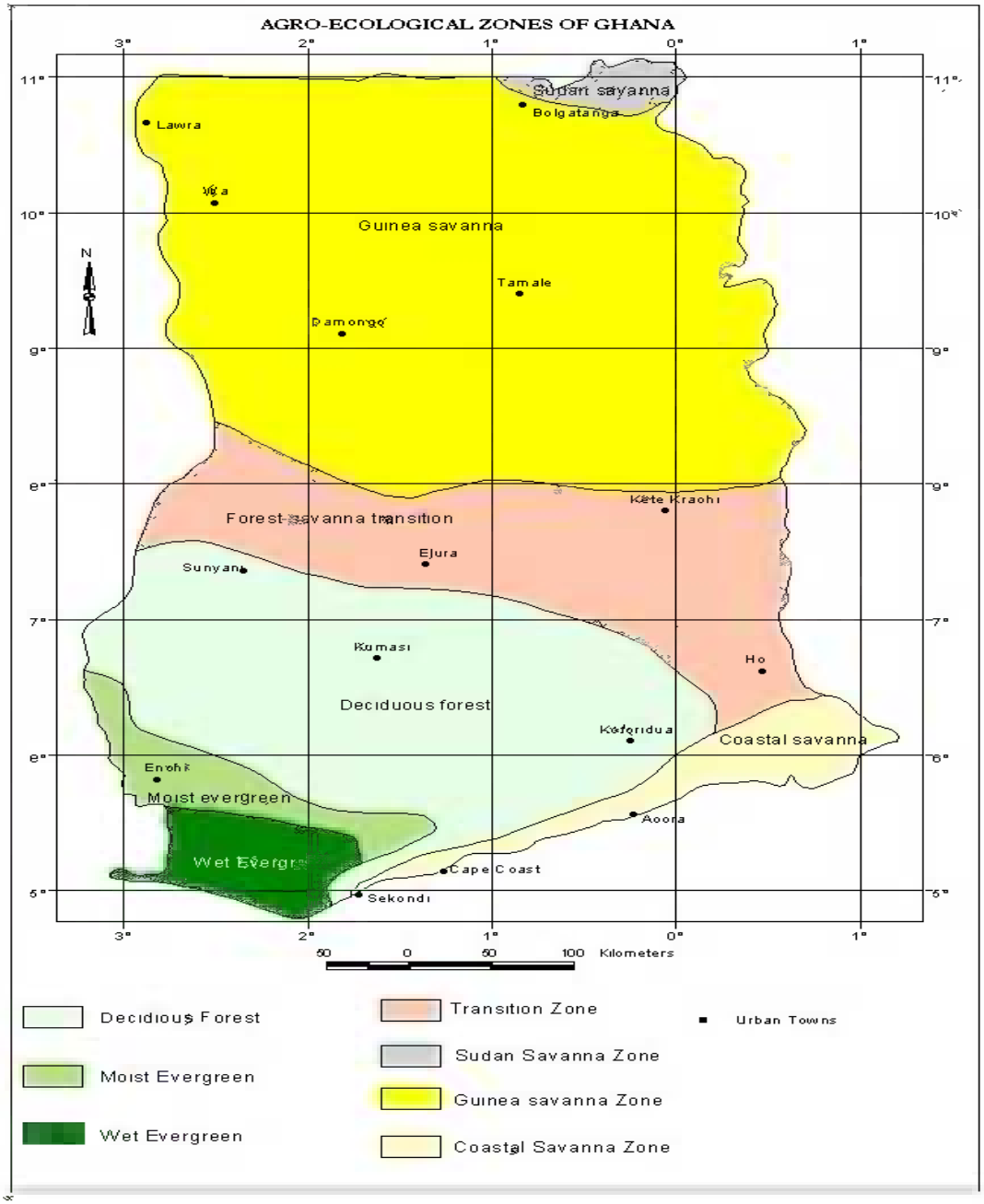


Figure 1.2 Map of agro-ecological zones in Ghana



2. Vital Country Statistics

Ghana is a relatively small country situated in the middle of West Africa. Its geographic location is the latitude 4o 44'N and 11o 11'N, and the longitude 3 o 11' W and 1 o 11'E. The total area is 238,530 km^2 of which 230,940 km^2 is covered by land and 8,520 km^2 by water. Ghana has a total of 2,094 km border with Burkina Faso (549 km) in the north, Cote d'Ivoire (668) km in the east and Togo (877 km) in the west (CIA - The World Fact book). It is bordered on the south by the Gulf of Guinea (Atlantic Ocean) with a coastline of 550 km.

Ghana's population was estimated to be 22.9 million as of July 2007. The national capital of Ghana is Accra, and it was estimated to have a population of about 2.09 million in 2007 (Wikipedia, the free Encyclopedia). The geographical coordinates of Accra are 5 33 N, 0 13 W with a time difference of UTC 0 (CIA - The World Fact book). The last official census took place in 2000. Table 1 provides the regional population breakdown. Ghana's overall population growth rate is estimated at 2.7 % per annum during the 1990s and 2000s.

There are ten administrative regions, and their populations and population growth rates are reported in Table 1. The highest population growth rate of 4.4 % is in the Greater Accra region, followed by the Ashanti region of 3.4 %. The lowest population growth rate is in the Upper East region (1.1%).

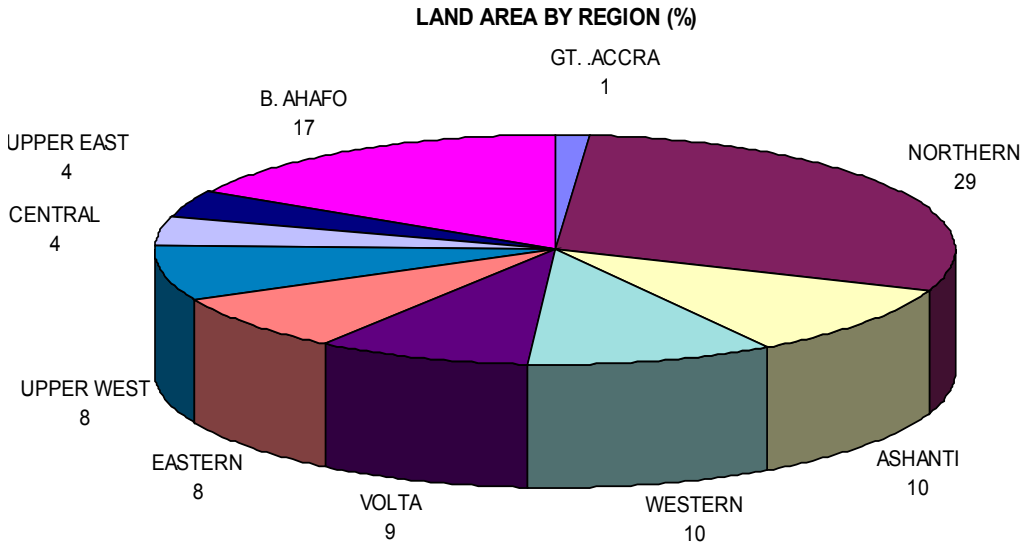
Table 2.1 The Population of Ghana based on 2000 Population Census

	Est. Population (Ghana)			Est. Rural Population		
Region	Total Population	Annual Growth Rate	% of Total	Total Population	% Rural	Density (Person/km^2)
Ashanti	3,612,950	3.4	19.1	1,685,405	46.6	148.1
Gt. Accra	2,905,726	4.4	15.4	358,532	12.3	103.0
Eastern	2,106,696	1.4	11.1	1,378,782	65.4	109.0
Western	1,924,577	3.2	10.2	1,226,159	63.7	80.5
Northern	1,820,806	2.8	9.6	1,337,016	73.4	25.9
Brong-Ahafo	1,815,408	2.5	9.6	1,136,628	62.6	45.9
Volta	1,635,421	1.9	8.6	1,194,337	73.0	79.5
Central	1,593,823	2.1	8.4	995,418	62.5	162.2
Upper East	920,089	1.1	4.9	775,807	84.3	104.1
Upper West	576,583	1.7	3.0	475,735	82.5	31.2
Total or Av.	18,912,079	2.7	100.0	10,637,809	56.2	79.3

Source: Ghana Statistical Services (GSS): Based on 2000 Population Census

The Northern Region occupies the largest land area (29%) while Greater Accra has the smallest land area (1%) as shown in Figure 2.1.

Figure 2.1 Land Area by Region (%)



Source: SRID, MoFA. Accra (2006)

Based on the 2000 census, Ghana in general has about 11 official languages, including English. These languages and the proportion of the population that speaks them are: are Asante (14.8%), Ewe (12.7%), Fante (9.9%), Boron (Brong) (4.6%), Dagomba (4.3%), Dangme (4.3%), Dagarte (Dagaba) (3.7%), Akyem (3.4%), Ga (3.4%), Akuapem (2.9%) and others, including English as official language (36.1%) (CIA - The World Fact book).

As explained in section 1, Ghana has five main agro-ecological zones which are defined on the basis of the climate and the natural vegetation. They include the rain forest, deciduous forest, transitional zone (i.e. forest-savanna transition), coastal savanna and northern savanna (Guinea and Sudan aavanna).

Agriculture has continued to be the dominant sector in Ghana's economy well into the 1990s and 2000s. Compared to the other two key sectors, industry and services, however, the performance of agriculture in terms of growth and expansion was the lowest during the 1990s. Since 2001, the agricultural sector has recovered, mainly due to the performance of the cocoa sub-sector, especially since 2003. The annual growth rate of the agricultural sector, which averaged only 1.1% during the first half of the 1990s, more than quadrupled to 5.1% during the first half of the 2000s (Table 2.2). This resurrected the contribution of agriculture to the country's Gross Domestic Product (GDP), from an annual average of 39.6% between 2000 and 2003 to 40.6% in 2005 (ISSER SGE Series, 2005).

The five sub-sectors that comprise Ghana's agricultural sector and their contribution to the total agricultural GDP are as follows: cocoa (13%), crops other than cocoa (64%), livestock (including poultry) (7%), fisheries (5%) and forestry and logging (11%). The cocoa sub-sector includes cocoa, coffee and shea nuts. The non-cocoa crop sub-sector includes cereals (maize, rice, sorghum and millet), roots and tubers (cassava, yams, cocoyam and sweet potatoes), industrial crops (tobacco,

cotton, kola nuts, citrus, oil palm, rubber, groundnuts, copra, cashew, soybean, and sugar cane), horticultural crops (pineapples, mangoes, pawpaw, peppers, onions, ginger, and exotic vegetables), and other crops (plantain, banana, beans, tomatoes, etc.). The fisheries sub-sector includes marine and fresh water products (tuna, shrimp, tilapia, mudfish, lobster, herring, etc.). The livestock sub-sector includes cattle, sheep, goats, pigs and poultry (consisting of chicken, ducks, guinea fowls, turkeys, and ostrich). The forestry sub-sector includes well-known tropical species (odum, mahogany, etc) and lesser-known secondary species.

Table 2.2 GDP Growth Rates (%) of the Major Sectors of Ghana's Economy, 1990-2005

Year	Agriculture	Services	Industry	Ghana's Total GDP	Agriculture's contribution to GDP
1990	-2.0	8.8	5.4	3.3	43.5
1991	4.7	6.3	3.7	5.3	43.3
1992	-0.6	7.7	5.8	3.9	41.4
1993	2.5	7.2	4.3	5.0	41.4
1994	1.0	5.0	1.3	3.8	40.8
1995	3.7	4.7	4.1	4.0	40.6
1996	5.2	4.2	4.8	4.6	40.8
1997	4.3	6.5	6.4	4.2	40.4
1998	5.1	6.0	3.2	4.7	40.6
1999	3.9	5.0	4.9	4.4	40.5
2000	2.1	5.4	3.8	3.7	39.6
2001	4.0	5.1	2.9	4.2	39.6
2002	4.4	4.7	4.7	4.5	39.5
2003	6.1	4.7	5.1	5.2	39.8
2004	7.5	4.7	5.1	5.8	40.4
2005*	6.5	5.4	5.6	5.8	40.6
Averages					
1990-94	1.1	7.0	4.1	4.3	42.1
1995-99	4.4	5.3	4.7	4.4	40.6
2000-05	5.1	5.0	4.5	4.9	39.9

*Provisional

Sources: Budget Statement and Economic Policy of the Government of Ghana (Annual series) and ISSER SGE Series (2005)

Agriculture is predominantly a smallholder activity in Ghana. About 90% of farm holdings are less than 2 hectares in area. Even though farmers are gradually turning towards the use of modern inputs such as improved seeds, the hoe and cutlass remain the main farming tools. Some level of mechanized farming is also practiced, even among smallholder farmers, but this is limited to the savannah and transition zones. In some parts of northern Ghana, bullock farming is practiced on a limited scale. In spite of the low input technology, smallholders account for about 80% of the total agricultural production. It is estimated that in Ghana about 2.74 million households operate a crop farm or keep livestock or both (GLSS IV). This has been the persistent trend in the 1990s and 2000s.

The output value growth rates of each one of the agricultural sub-sectors have generally been low during the 1990s. During the second half of the 1990s, the overall annual growth rate was less than 5% in all sub-sectors except cocoa and forestry/logging, which recorded 6.3% and 5.3%, respectively (see Table 2.3).

Table 2.3 Growth Rates in the Agricultural Sub-Sector, 1990-2005

	Sub-Sector Growth Rate (%)				
Year	**Crops/Livestock**	**Cocoa**	**Forestry/Logging**	**Fisheries**	**All Agriculture**
1990	-4.1	2.9	3.9	2.8	-2.0
1991	6.8	-1.9	2.0	1.8	4.7
1992	-1.9	2.2	3.4	1.8	-0.7
1993	3.0	Na	1.2	2.4	2.5
1994	0.9	Na	1.8	1.2	1.0
1995	3.1	11.1	2.0	1.6	3.7
1996	3.9	6.0	2.3	2.0	5.2
1997	4.5	4.0	5.6	1.0	4.3
1998	4.4	11.0	10.0	1.8	5.1
1999	4.7	-0.5	6.8	1.0	3.9
2000	1.1	6.2	11.1	1.6	2.1
2001	4.6	-1.0	4.8	2.0	4.0
2002	5.2	-0.5	5.0	2.8	4.4
2003	5.3	16.4	6.1	3.0	6.1
2004	5.4	29.9	5.8	3.5	7.5
2005*	6.0	13.2	5.6	3.6	6.5
Averages					
1990-94	0.9	1.1	2.5	2.0	1.1
1995-99	4.1	6.3	5.3	1.5	4.4
2000-05	4.6	10.7	6.4	2.8	5.1

*Provisional; Na = Not available

Source: Budget Statement and Economic Policy of the Government of Ghana (Annual series) and ISSER SGE Series (2005)

Note: The contributions and growth rates of crops and livestock have traditionally been combined in Ghana, and there is no disaggregated data available at this stage.

Particularly for cocoa, there have been large variations in growth as negative growth rates were recorded in 1991 and 1999 and again in 2001 and 2002; and yet cocoa recorded the highest single year growth rates ranging from 13.2% to 29.9% between 2003 and 2005. Crops and livestock, which constitute the largest sub-sector, recorded low and even negative growth rates during the early 1990s, but have recovered well during the 2000s. The growth rate for the crop/livestock sub-sector has been above 5% since 2002. Overall, growth rates in all of the agricultural sub-sectors were higher during the first half of the 2000s than during the 1990s. However, there is no disaggregated data available to permit a breakdown of the growth rates within the livestock sub-sector.

3. The Role of the Poultry Sector in the Ghanaian Economy

An overview of the economy

Ghana has an agrarian economy. The country experienced a real Gross Domestic Product (GDP) growth rate of between 3.3 % and 4.7 % over the 1993-2002 period, which then rose to 5.2 % in 2003 and 5.8 % in 2004 (Ghana Budget Statement, 2005). In 2002, the GDP amounted to US$6.2 billion and the external debt was US$7.4 billion. Export revenues amounted to US$2.1 billion in 2002, which increased slightly to US$2.3 billion in 2003. 56 % of the total population of 22.9 million is located in rural areas of the country.

The major export commodities are cocoa, timber and gold, which together accounted for US$1.3 billion (64.7%) and 1.8 billion (78.8%) of total export revenues in 2002 and 2003, respectively. Non-traditional exports (including horticultural products, handicrafts, textiles and processed fish) amounted to US$490.1 million in 2003, down from US$728.7 million in 2002 due to declining exports of aluminum products as the Volta Aluminum Company (VALCO) remained closed (MoFE, 2004). Considering that trade is critical for Ghana's economic growth and development, the economy has largely been liberalized since the mid 1980s with the onset of the structural adjustment programme (SAP) under the auspices of the Breton Woods institutions, namely: the World Bank (WB) and the International Monetary Fund (IMF). The SAP followed the economic recovery programme (ERP) of the early 1980s, which was in response to a macroeconomic crisis of that period. The country joined the Heavily Indebted Poor Country (HIPC) group in 2002.

Ghana's agricultural trade is dominated by primary commodities, mainly cocoa, timber and non-traditional exports such as pineapples and other fruits and vegetables. Even though the country is self-sufficient in some staples such as cassava, yam, plantain and maize in good rainfall years, food imports have been on the increase since the mid-1990s. In particular, wheat, which is not cultivated in Ghana, is 100 % imported. The local production of rice accounts for only about 40% of annual consumption, and therefore rice imports have been on the increase, in spite of government efforts to address the rising rice imports. Similarly, the country imports about 60 to 70% of meat (including poultry) products to meet the domestic demand.

The Human Development Index (HDI), which looks beyond the GDP and includes a broader definition of well-being, provides a composite measure of three dimensions of human development. These include living a long and healthy life (measured by life expectancy), education (measured by adult literacy and enrollment at the primary, secondary and tertiary level) and having a decent standard of living (measured by the purchasing power parity (PPP) income). The index is still not a comprehensive measure of human development. It does not, for example, include important indicators such as gender or income inequality and difficult to measure indicators, such as respect for human rights and political freedoms. The HDI for Ghana is 0.553, ranking 135th out of 177 countries with data (Human development report – going beyond income, 2007/2008 – UNDP). Life expectancy at birth is 59.1 years (and Ghana ranks at 137th); the adult literacy rate is 57.9 % (of ages 15 years and older, and Ghana ranks at 117th); combined primary, secondary and tertiary gross enrolment ratio is 50.7 % (and Ghana ranks at 146th), while GDP per capita (PPP US$) is 2,480 (and Ghana ranks at 126th).

Contribution of the poultry sub-sector to the economy

Number of people employed in the poultry sector

There is no information on the number of people employed in the poultry sector. Village poultry rearing is not the main occupation of farmers, although it provides substantial support to rural households (Aboe et al., 2006b). 66% of the 3.7 million households living in rural Ghana keep village poultry. Therefore, it can be assumed that nearly 2.5 million households benefit from village poultry production. The number of commercial poultry workers, as estimated from the commercial farms with official records (Table 3.1), is about 7000.

Linkages between poultry sub-sector and other industries

In addition to labour, the main inputs to the poultry sub-sector are day old chicks, feed, as well as drugs and vaccines. Day old chicks are sourced from the hatcheries of the large-scale farms or from commercial importers.

Commercial poultry production in Ghana relies heavily on local maize production, and is supplemented with yellow maize imports. Wheat bran is an important feed ingredient and it is supplied as a by-product of wheat flour milling by four factories in the country.

The cost of production of maize in Ghana has increased steadily from ¢139,390 in 1994 to about ¢2,000,000 per tonne in 2005 (Table 3.1). Undoubtedly, this has contributed to the escalating cost of commercial poultry production.

Table 3.1 Producer price of maize in Ghana (1994-2005)

Year	Producer price (Cedis/ton)
1994	139,390
1995	258,190
1996	317,920
1997	666,660
1998	559,051
1999	361,244
2000	749,304
2001	1,201,304
2002	1,073,344
2003	1,497,000
2004	1,824,946
2005	1,992,989

Source: FAOSTAT, 2008.

Other feed ingredients such as fishmeal, soya bean cake and vitamin-mineral premix are imported, as are poultry drugs and vaccines. Medium and small-scale commercial farms rely on feed milling companies. Table 3.2 shows feed production in the Greater Accra Region between 2001 and 2005. There has been a modest annual increase in feed production over this period, however feed millers have stated that their production would have increased had poultry production increased.

Table 3.2 Poultry Feed Production (Greater Accra)

Year	Average Production of 12 Companies (tons)	Afariwaa Farms (for farm operations)
2001	3327.0	1545.0
2002	3993.8	1302.0
2003	3556.7	1485.0
2004	4043.3	2160.0
2005	7392.0	1371.0

Source: Aning, 2006

Structure of the Poultry Sector

Poultry production in Ghana may be classified into three categories according to installed capacity, marketing system and level of integration of its operations. These are commercial (or industrial), semi-commercial and backyard producers (Figure 3.1). The FAO classification, in addition to the above criteria, includes the level of biosecurity (Aning, 2006).

According to the FAO classification (1-4) (see Aning, 2006), Sector 1 (industrial and integrated) has a high biosecurity level, with clearly defined and implemented standard operating procedures for biosecurity. The operations are part of an integrated enterprise.

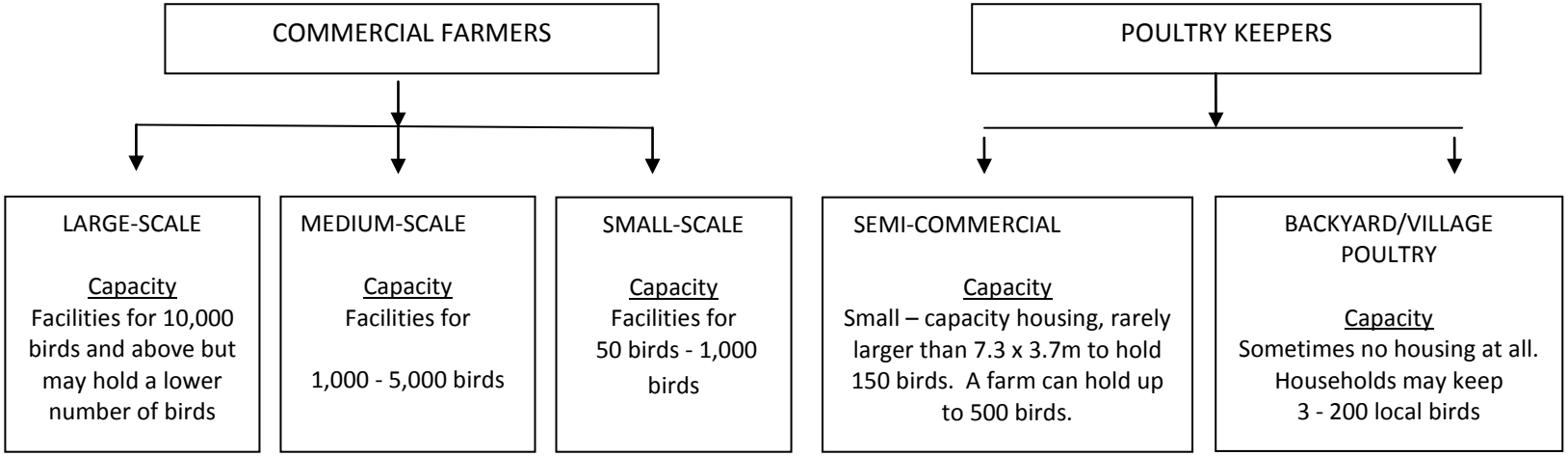
Sector 2 (commercial) supports a moderate to high biosecurity level; birds are kept indoors continuously and prevented from coming into contact with other poultry or wildlife.

Sector 3 (commercial) has low to minimal biosecurity, where birds are kept in open sheds and may even spend time outside these sheds. Birds/products may be sold at the live markets.

Finally, Sector 4 (Village and backyard) is characterized by minimal biosecurity and birds and their products are consumed locally.

Poultry farms in Ghana operate their own biosecurity (cleaning/disinfection) standards, which are set according to farmers' experience, although veterinary authorities also provide advice. With the exception of imposed bans on movement during the HPAI outbreaks in Ghana in 2007, poultry farmers are not restricted by movement and transportation regulations.

Figure 3.1 Structure of the Poultry Industry in Ghana



Source: Ghana National Association of Poultry Farmers (GNAPF)

Commercial (Industrial) System

Although there are a few large-scale commercial farms in Ghana, which are integrated with hatchery, production, feed mill marketing and sometimes processing units, none of these practice biosecurity levels that would qualify them for FAO Sector 1 status (Aning, 2006).

Large-scale farms have an installed capacity of over 10,000 birds each, operating their own feed mill of at least a one ton mixer and hammer mill and employing at least five permanent workers registered with the Social Security and National Insurance Trust (SSNIT) of Ghana (Regulations of the Large Scale Poultry Farmers Association – Greater Accra).

There are only five such farms in Ghana and they are privately owned. These operations are located mainly in the Ashanti and Greater Accra and Brong-Ahafo regions (Table 3.3).

Medium commercial poultry farmers have installed capacities of 1,000 to 5,000 birds, whereas small-scale farms produce less than 500 birds. Medium and small-scale commercial farms rely on the large-scale integrated farms for their day old chicks and feed, but may also obtain feed from other sources. In these farms, birds are always kept indoors, on deep litter or in battery cages. These medium and small-scale operations fall under Sector 3 of the FAO classification.

Table 3.3 Distribution of Commercial Poultry Farms and Systems of Operation

Administrative Regions	FAO System				Total
	1	2	3	4[a]	
Greater Accra	-	146	342		487
Central	-	8	24		32
Western	-	7	51		58
Eastern	-	6	27		33
Volta	-	-	6		6
Ashanti	-	169	329		498
Brong-Ahafo	1?	44	173		218
Northern	-	-	21		21
Upper East	-	-	3		3
Upper West	-	-	15		15
Total	1?	380	991		1372

Source: Aning, 2006

[a] – Comprises local chickens kept by the majority of almost all rural and peri-urban households 5-25 birds/household) and in a small number of cases, exotic birds (10-15 household kept in backyards.
Current distribution data by region are not available. - Based on interview only.

Semi-Commercial System

Semi-commercial poultry farms are usually located in the owners' backyard, but the birds raised are exotic breeds, largely cockerels for sale during festive occasions (Henaku, personal communication). However, recently, some Non-Governmental Organizations (NGOs) have initiated schemes to encourage production of eggs in this system (Akunzule, 2006). The number of birds kept typically is below 500. In most cases, they are always housed on deep litter, but in some cases the birds may be allowed into chicken runs. The level of biosecurity in these farms is low.

Backyard/Village Poultry Production System

This system is predominantly comprised of traditional village poultry (chicken, guinea fowl, ducks, turkeys, doves) raised mainly to supplement household incomes and to supplement household meat and egg consumption (Aboe et al, 2006a). The birds are also given as gifts to esteemed visitors and may be used as payment for a dowry and in religious and cultural rites. This system is characterized by low-input of feeding and housing, which makes it profitable. Birds are scavengers, but are given supplementary feed and usually housed at night. Almost all households in the rural areas keep some poultry in this system. The main constraint to production is Newcastle disease (Aboe et al, 2006b; Awuni, 2002). This system falls under Sector 4 (FAO classification) with very minimal biosecurity.

Numbers of Commercial, Semi-commercial and Backyard Production Enterprises

The total number of commercial poultry farms in Ghana (large-scale, medium and small-scale) was estimated at 1372 in 2005. Their regional distribution and FAO classifications are shown in Table 3.3 above.

Numbers of Different Species of Poultry

The numbers of different species of poultry in Ghana and their regional distributions are reported in Table 3.4. These are not classified according to the production system. It is, however, possible to infer that the figures for layers, broilers and cockerels are for commercial production.

Projections of poultry populations in each one of the administrative are reported in Table 3.

Table 3.4 Numbers of the Poultry species and their Regional Distribution (1996)

Category	Upper East Region	Upper West Region	Northern Region	Brong Ahafo Region	Ashanti Region	Eastern Region	Greater Accra Region	Volta Region	Central Region	Western Region	National
											TOTAL
Layers	460	26,701	-	208,934	1,206,291	-	2,716,518	-	305,518	-	4,464,522
Broilers	-	23,861	-	53,680	115,803	-	22,180,934	-	88,124	-	2,462,402
Cockerels	2,056	27,097	-	28,824	101,776	-	-	596,428	60,668	-	816,849
Local Fowls	391,869	569,819	1,100,737	401,916	361,537	311,210	387,706	-	205,420	-	3,710,214
Unspecified	-	-	-	-	404,665	436,825	-	238,303	-	304,110	1,383,004
Ducks	31,200	22,070	93,543	23,820	37,164	52,885	33,216	75,560	16,504	-	385,962
Turkeys	5,267	45,364	11,440	9,861	19,358	14,288	16,575	13,922	5,918	-	141,993
Guinea Fowls	362,957	284,763	354,142	60,853	40,247	11,731	21,483	46,632	2,526	-	1,185,334
Pigeons	18,116	6,061	-	9,237	-	-	4,379	-	-	-	37,793
Parrot	-	-	-	21	-	-	309	-	-	-	330
Ostrich	-	-	3		-	-	-	-	-	-	3
Total	811,926	1,005,730	1,559,665	797,146	2,266,841	826,940	5,341,120	970,845	664,776	304,110	14,589,306

Source: Livestock Planning and Information Unit data (2006)

Table 3.5 Poultry Populations and Distribution in Ghana

Administrative Regions	Census		Projections				
	1995	1996	2001	2002	2003	2004	2005
Greater Accra	4,179,458	5,341,120	10,160,174	11,729,071	13,540,230	15,631,062	18,044,753
Central	676,089	684,778	939,391	871,023	903,308	936,790	971,514
Western	247,377	304,110	380,039	401,405	423,971	447,806	472,982
Eastern	747,496	826,940	1,223,531	1,328,907	1,443,358	1,567,665	1,702,679
Volta	1,160,028	970,845	1,192,775	1,206,122	1,219,619	1,233,267	1,247,067
Ashanti	2,103,541	2,286,841	3,880,693	4,290,010	4,742,500	5,242,716	5,795,693
Brong Ahafo	863,630	797,146	1,571,243	1,765,314	1,983,356	2,228,328	2,503,559
Northern	1,468,320	1,559,865	1,749,368	1,792,610	1,836,921	1,882,328	1,928,856
Upper East	888,475	811,925	763,276	747,563	732,174	717,101	702,339
Upper West	912,898	1,005,736	968,151	983,429	998,949	1,014,713	1,030,727
Total	13,082,557	14,589,306	22,828,641	25,115,454	27,824,386	30,901,776	33,525,809

Source: Livestock Planning and Information Data, 2006

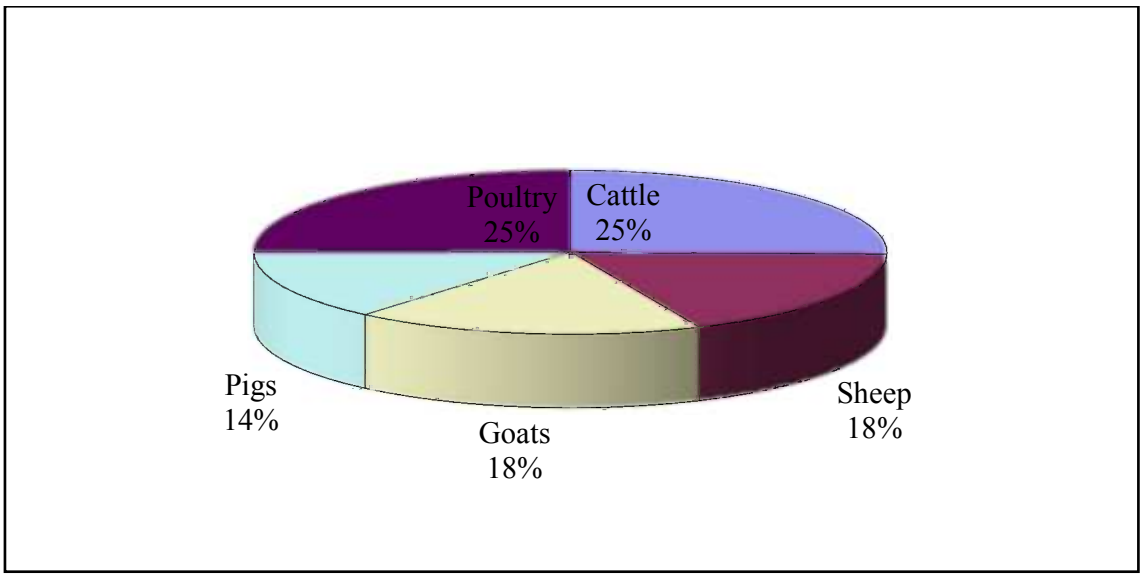
Proportion of commercial, semi-commercial and backyard population that enters the wet market

On account of the overriding population of birds produced in the free-range, backyard and village poultry sector, it can be inferred that the majority of poultry products on the wet markets in rural areas come from this sector. In urban areas, where commercial production is concentrated, wet markets, supermarkets and other retailers are expected to source mainly from commercial and semi-commercial farms.

Poultry Production, Consumption and Trade

Poultry production in Ghana is mainly a smallholder activity, even though a few large commercial farms exist (Table 3.3). It is an important domestic source of meat, contributing as high as 25% (same as cattle) of the total domestic meat production between 2000 and 2004 (see Figure 3.2).

Figure 3.2 Average contribution of poultry to domestic meat production (2000 to 2004)



Source: SRID, MoFA. Accra (2006)

Table 3.6 reports the sources of poultry meat (domestic production and imports) in Ghana from 1995 to 2004.

Table 3.6 Potential sources of Poultry Meat (metric tons) in Ghana (1995-2004)

Year	Total	Domestic (%)	Imports, Frozen (%)
1995	13,803	12,112 (88)	1,691 (12)
1996	18,201	14,519 (80)	3,682 (20)
1997	22,817	16,926(74)	5,891 (26)
1998	24,144	19,333 (80)	4,811 (20)
1999	32,517	21,740 (67)	10,776 (33)
2000	33,307	24,147 (72)	9,160 (28)
2001	56,815	26,554 (47)	30,261 (53)
2002	48,947	28,962 (59)	48,947 (41)
2003	59,166	31,369 (53)	27,798 (47)
2004	72,864	33,776 (46)	39,098 (54)

Source: LPIU, MOFA (2005).

Since 1999, the proportion of poultry meat imported has increased tremendously to meet a demand that has not been met by local production. In 2003, an attempt was made by the government of Ghana to curtail levels of importation to protect and promote local production through the imposition of a 20% supplementary import duty on poultry meat imports.

In that year, domestic production supplied 53% of total poultry meat in Ghana. But the policy was rescinded when it came under pressure from the International Monetary Fund (See Appendix 1) and other external donors. The following year, domestic poultry production dropped to 46% and imports rose to 54% (Table 3.6).

Local poultry meat is derived from both exotic (commercial) birds and local (village) breeds, as reported in Table 3.7.

Table 3.7 Estimated local poultry meat production (in tons) (1995-2005)

Year	Exotic (Commercial)		Birds	Sub-Total	Local	Grand Total
	Layers	Broilers	Cockerels		chickens	
1995	5,738	2,474	305	8,517	3,595	12,112
1996	5,804	3,201	1,062	10,067	4,452	14,519
1997	5,870	3,928	1,818	11,617	5,309	16,926
1998	5,936	4,655	2,575	13,167	6,167	19,333
1999	6,002	5,383	3,332	14,716	7,024	21,740
2000	6,068	6,110	4,088	16,266	7,881	24,147
2001	6,135	6,837	4,845	17,816	8,738	26,554
2002	6,201	7,564	5,601	19,366	9,595	28,962
2003	6,267	8,291	6,358	20,916	10,453	31,369
2004	6,333	9,018	7,114	22,466	11,310	33,776
2005	6,399	9,746	7,871	24,016	12,167	36,183

Source: LPIU, MOFA (2005)

The above figures reflect the relative contributions of commercial and village poultry to local poultry meat production.

Although it is generally assumed that village poultry forms about 80% of the national poultry populations, Table 3.7 shows that a greater proportion of poultry meat consumed in Ghana is of exotic poultry origin, and that locally produced poultry meat is unable to meet demand.

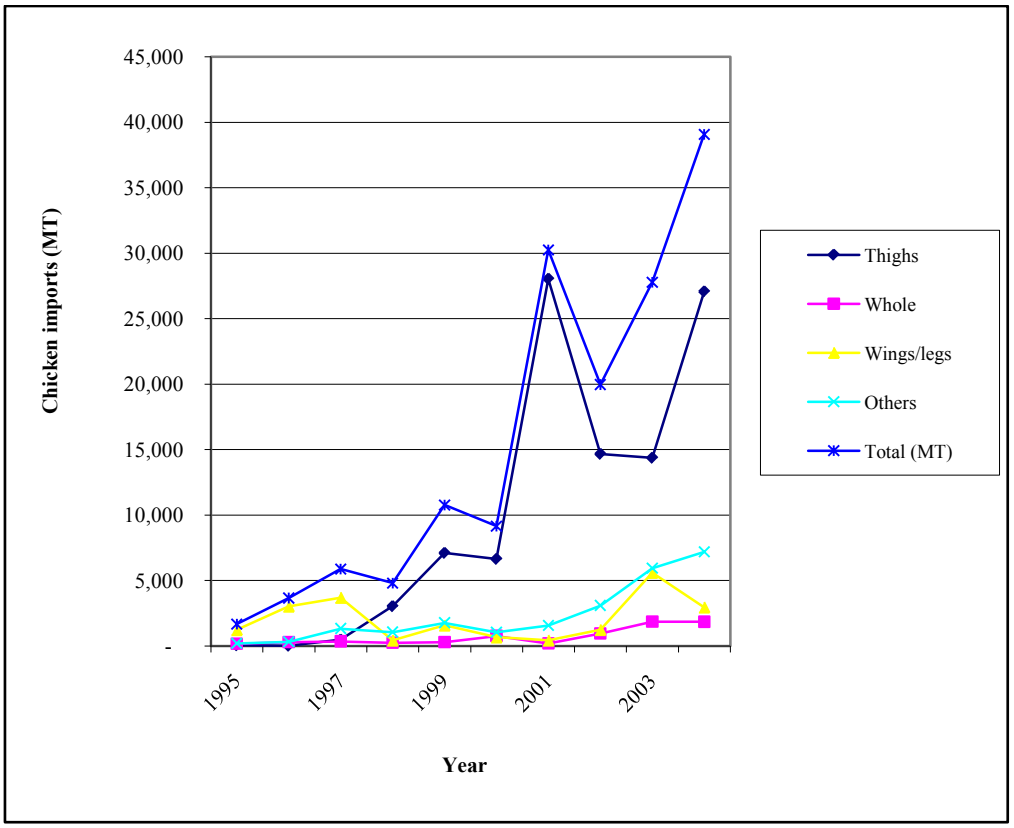
According to the National Association of Poultry Farmers (GNAPF) (Appendix 2), this situation arose due to the 'dumping' of cheaper (subsidized) poultry meat on the Ghanaian market, while at the same time, Ghana government subsidies on some production inputs, such as drugs, were removed and import duties on others were increased with the restructuring of the Ghanaian economy.

Local broiler production has consequently become barely profitable and many farmers have switched to egg production. This has affected hatchery operations, with most hatcheries operating well below capacity. Their operations are currently limited to producing day old broiler chicks to meet the market for Christmas and Easter festivities and the pullet replacement operations of egg producers. Other activities in the poultry sector chain have also been adversely affected.

The recent increases in poultry meat imports, particularly for chicken which has increased more than four times between 2000 and 2005 (see Table 3.4), underscores the important role poultry imports have assumed in Ghana in recent years. A critical look at the chicken meat types further provides evidence of consumption turning towards chicken parts rather than whole chicken.

The changes have been particularly significant in the case of chicken thighs (Figure 3.3), which seem to be preferred because of the ease of use in preparing many Ghanaian dishes. Prior to 1997, chicken wings and legs were the major chicken parts imported. However, this composition changed in favor of increasing imports of chicken thighs and this has been the trend since 1997. Importation of whole chicken is minimal. On the whole, chicken importation has risen consistently since 1995 with chicken thighs dominating and rising to almost 30,000 tons in 2001 and in 2004. Poultry imports over the period between 2000 and 2004 have increased by about 1200%.

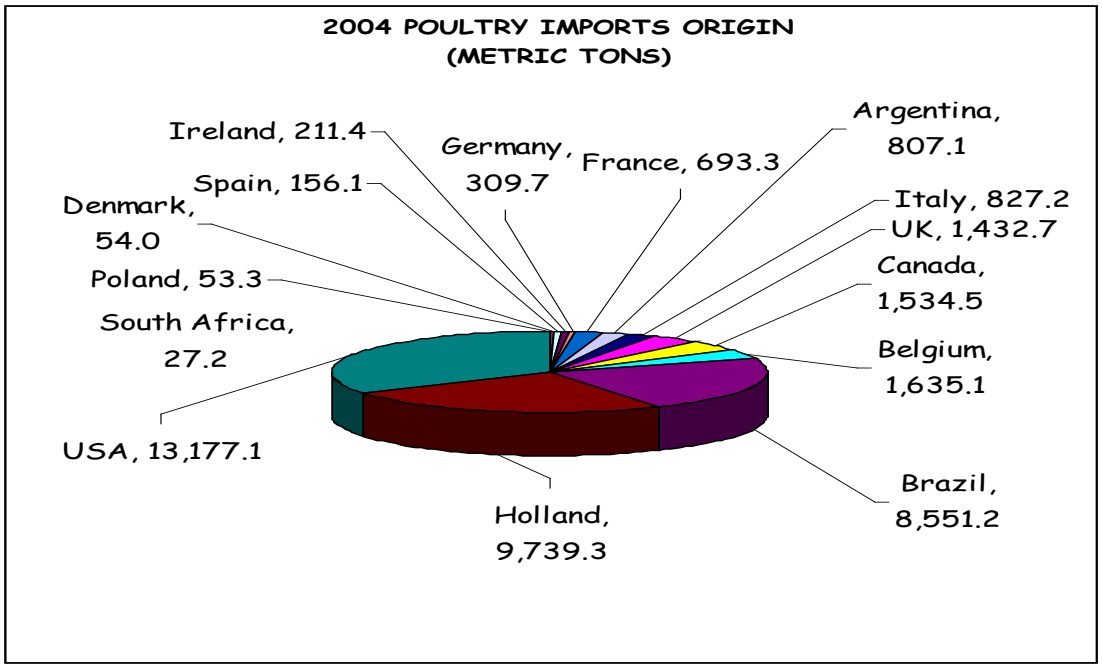
Figure 3.3 Imports of Chicken Parts, 1995 - 2004



Source: Asuming-Brempong et al (2006)

The major countries exporting poultry meat to Ghana are Brazil, the member countries of the European Union and the United States of America, which together account for more than 75% of total poultry imports (see Figure 3.4), with the USA being the biggest exporter to Ghana followed by the Netherlands and Brazil.

Figure 3.4 Major countries that exported poultry meat into Ghana in 2004 (tons)



Source: Asuming-Brempong et al (2006). Computed from data obtained from LIPU of MOFA and MOTI

The tariff imposed on imported food items, including poultry products, has not changed since the 1990s. The basic tariff has stood at 20%, but other taxes such as Value Added Tax (VAT), National Health Insurance Levy (NHIS) and Economic Community of West African States (ECOWAS) levy have been added over time (Table 3.8). Even though some identifiable bodies (such as the Ghana Poultry Farmers Association) have tried to pressure the government into raising the tariff on poultry imports to improve the competitiveness of local production, they have not succeeded, mainly due to the government's commitment to existing multilateral and bilateral arrangements.

Table 3.8 Tariff and other taxes on imported poultry meat

Custom Duty (tariff)	Value Added Tax	National Health Insurance Levy	ECOWAS Levy	EDIF Levy	Destination Inspection Scheme	Total Taxes	WTO Bound Rate
20%	12.5%	2.5%	0.5%	0.5%	1.0%	37.0%	99%

Source: MOTI and CEPS, Accra
Note: charges are the same for all imported commodities studied

Description of the Major Value Chains for the Poultry Sector

Imported poultry products are usually sold through well organized cold chains in the cities and other urban centres. Importers may have their own cold-chains in cities from where they sell to wholesalers, who in turn sell to retailers and consumers in small cold-storage facilities. A large percentage of imported poultry meat is sold directly to institutions (such as the military, schools and hospitals), hotels and restaurants; however, there are currently no available statistics on the quantities supplied to various players in the value chain. In rural areas where electricity is available, or sometimes through the use of small generators, poultry products are sold to consumers in small quantities, e.g., in 1 kg to 5 kg packages.

A few large commercial poultry enterprises in Ghana, such as Darko Farms in Kumasi, have excellent facilities for processing poultry for sale, but enterprises such as this one constitute only a small fraction of the total poultry produced. Most local commercial poultry is sold as whole live chicken either on the farm or in cages in markets in the cities and urban areas. It is common to find traders, mostly women, buying large numbers of live chicken (broilers, cockerels or old layers) from the farm gate which they keep and retail in the markets in cages. This is particularly common during festivities, such as Christmas or Easter seasons. Local poultry are also sold in a similar manner; and in addition, poultry keepers may sell them at popular spots along all the major routes across the country.

Apart from institutions, which may be supplied directly from commercial poultry farms, eggs are sold in crates at the farm to wholesalers and retailers who in turn sell to consumers at the open market. In some cases, commercial farms may bring crates of eggs into the markets and retail the eggs themselves. In addition to the imported poultry products that are sold in supermarkets, some commercial poultry farmers also supply these supermarkets with both poultry meat and eggs. However, there is no available data on prices, seasonality, and marketed volumes of poultry and poultry products by these supermarkets.

4. Detailed Review of the Poultry Sector and Biosecurity

Commercial Poultry Production

Breeding

For chickens, breeding farms are limited to stocks for both layers and broilers. There is one parent stock for turkeys, which is located at the Mfum Farms in the Ashanti Region.

Table 4.1 Poultry Breeding Farms in Ghana

Category	Present in Country (Yes/No)	
	Chicken	Turkey
Pedigree pure lives	No	No
Great grand parents	No	No
Grand parents	No	No
Parents	Yes	Yes
Layers	Yes	Yes
Broilers	Yes	Yes

Source: Ghana National Association of Poultry Farmers (GNAPF)

Commercial Sector Actors

Currently five parent stock operators produce chicken hatching eggs. Four of these are in the Ashanti Region and one is in the Greater Accra Region (Table 4.2). One of them stock 20,000 birds; however, data on the capacity of the others are unavailable. The breeds of parent stock held collectively by these farms are listed in Table 4.2.

Table 4.2 Parent stock Breeding Actors (Chicken)

Types	Breeds	Enterprises	Location of Enterprise	No. of birds	Lifespan of birds (Weeks)
Parent stock	Layers				
	Nera	Topman	Ntensere, AR	20,000	70 weeks
	Lohman	Mfum Farms	Mim, AR	NA	NA
	Bovan	Akate Farms	Antoa Rd, AR	NA	NA
	Isa Brown	Asamoah-Yamoa	Kegyasi, AR	NA	NA
	Hyline	Afariwaa Farms	Michel Camp,G-AR	NA	NA
	Broilers				
	Arbo-acres				
	Cobb (Imported eggs)				

AR -Ashanti Region; GAR - Greater Accra Region
NA -Not Available.
Source: Ghana National Association of Poultry Farmers (GNAPF)

In Ghana, the preferred parent stock breeds are those that produce brown eggs and heavier layers to satisfy market preferences.

Hatchery Operators

On account of low demand of day old chicks (See Section 3.6), out of 17 hatchery operators that were active in 2005 (Aning, 2006) only six are currently producing layer, broiler and guinea fowl day

olds (Table 4.3.) These are mainly those that operate parent stock farms. They produce between 10 and 25% of their installed capacity, for reasons previously stated.

Table 4.3 Hatchery Operations

Types	Breeds	Enterprises	Location	Production Capacity	Lifespan
Hatchery	Nera	Topman	Ntensere, AR	2.1 million	NA
	Lohman	Mfum Farms	Mim, AR	4.5 million	NA
	Bovan	Akate Farms	Antoa Rd, AR	NA	NA
	Isa Brown	Asamoah-Yamoa	Kegyasi, AR	4.2 million	NA
	Hyline	Afariwaa Farms	Michel Camp, G-AR	6 million	NA
	Arbo-acres				
	Cobb				

Source: Ghana National Association of Poultry Farmers (GNAPF)

Rearing, Broiler and Layer Actors

Detailed information on these are unavailable. Data compiled for commercial (large, medium and small-scale) layer operations in Ghana in 2005 are reported in Table 4.4.

Table 4.4 Production by Commercial farms in Accra (2005)

Administrative Region	No. of Operations	Estimated No. of eggs (millions)[1]
Greater Accra	487	323.2
Ashanti	498	1032.1
Brong Ahafo	218	150.0
Central	32	28.5
Western	58	36.2
Total	1075	1570.0

[1]Estimates based on stockholdings per farm and 66% egg production.
Source: Aning, 2006

Support Services Actors

Feed mill

Feed mill operations are concentrated in the Greater Accra, Brong-Ahafo and Ashanti Regions (Table 4.5) where almost all commercial poultry production occurs. Operators produce between 12.5 to 90% of their installed capacity. Only one actor (Akate Farms) produced 100% of its 5,980 ton capacity. A total of 62,325 ton of all types of poultry feed was prepared by 16 operators in 2006. Low level operations, once again reflects the levels of local poultry production.

Table 4.5 Commercial Feed Producers (2006)

Feed mill	Location	Integrated[1] (Yes/No)	Throughout (2006) (tons)
Ghana Agro Food Co.	Tema, GAR	No	26,000
Afariwaa Farms	Michel, GAR	Yes	1,545
Kosher Feed mills	La, GAR	No	3,375
Presby Agric. Station	Abokobi, GAR	Yes	520
GAPFA, Accra	Sakaman, GAR	Yes	6,264
Central Feed mills	Adenta, GAR	No	1,136
Takmal Animal Feeds	Nima, GAR	No	1,044
Topman	Ntensere, AR	Yes	NA
Darico Feeds	Akropong, AR	Yes	5,000
Marinoff Farms	Ahodwo, AR	Yes	663
Agricare Ltd	Kumasi, AR	No	5,608
Akate Farms	Antoa Rd, AR		5,980
MM Unity Farms	Dormaa, BAR	Yes	2,340
Kwadwo Amadu Farms	Koraso, BAR	Yes	1,030
Kwajasco Farm Complex	Nyankonaso, BAR	Yes	1,560
Owusu Yeboa Farms	Chiraa, BAR	Yes	260
Rapp & Co	Takoradi, WR	No	NA
Glamour	Adenta, GAR	Yes	NA

AR: Ashanti Region; BAR: Brong Ahafo Region; GAR: Greater Accra Region[1]
- Integrated Feed mill produces for its own farms which may also have its own poultry processing plant.

Sources: Ghana Feed millers Association, Animal Production Directorate, MOFA.

Transport of Feed, Day old Chicks, Broilers and Spent Layers and Egg Packing Plant

The larger commercial farms have vehicles for transportation of feed, birds and other items. Most producers and marketers, therefore, depend on the public transportation system. This presents a serious biosecurity challenge to the poultry sector.

Abattoirs and Meat Processing Plants

Table 4.6 lists poultry abattoirs and processing plant operators. Two of these (Afariwaa and Asamoa-Yamoa) in principle provide necessary facilities for "satellite" broiler producers. The latter are smaller farms located around the processing plants. They may be provided day old chick feed and other inputs for broiler bird production by the larger farms. The live birds are then acquired by these larger farms for processing into whole frozen chicken for sale. Alternatively, the "satellite" farms may produce at their own cost and sell to the processing plant operates at an agreed price. This practice does not seem to be working well.

A large fast food company (Papaye) processes its own birds. SOTREC converts chicken meat into other products. A list of abattoirs and processors is given in Table 4.6.

Table 4.6 Abattoirs and Poultry Meat Processors

Processing Plant	Location	Integrated	Throughput per year
Midland (Darko) Processing Plant	Akropong, AR	Yes	NA
Asamoa-Yamoa[1]	Kegyasi, AR	Yes	NA
Afariwaa Farms[1]	Michel Camp, GAR	Yes	NA
Farmer George	Prampram, GAR	Yes	NA
Papaye	Accra, GAR	No	NA
SOTREC[2]	Accra, GAR	No	NA
Stillwaters[3]	Kumasi, AR	No	NA

[1] Provide processing facilities for "satellite" broiler producers

[2] Adds value, producing nuggets, sausages, frankfurters and marinated chicken (Aning, 2006)

Poultry Vaccine Producers and Specialized Poultry Veterinarians

The fowl pox vaccine was produced at the Veterinary Laboratory of MOFA, but production has been discontinued due to out-of-date equipment. No poultry vaccines are therefore produced in Ghana.

There are four specialist poultry veterinarians, two stationed in Accra and two in Kumasi. Most of the veterinarians in the poultry producing areas of the country have considerable experience in the diagnosis and control of various poultry diseases. Various seminars and workshops have been regularly held for veterinarians in Ghana, even prior to the HPAI outbreaks of 2007. Consequently, the expertise of veterinarians in the field and laboratory diagnosis of HPAI is considerable.

Backyard Poultry Production

Backyard poultry rearing and the predominant free-range village chicken productions account for 60-80% of the national poultry population (FASDEP, 2002; Gyening, 2006; Awuni, 2007). Village chickens of the Frizzle, Barred, Naked Neck varieties and their exotic crosses were estimated to be 12 million in 2002 (Amakye-Anim, 2002) and over 20 million in 2005 (FAOSTAT).

There are 3,701,241 households in Ghana (Ghana National Census, 2000), 65% of which reside in rural areas. Assuming that each rural household keeps an average of 30 village chickens (Awuni, 2002; Aboe et al., 2006b), the total rural poultry population would exceed 72 million. Guinea fowl production presents an opportunity for poverty reduction in the three northern regions of Ghana on account of its high market demand.

Semi-Commercial rural poultry keeping

The limited semi-commercial poultry rearing mentioned above consists of raising cockerel for meat, especially for festive occasions. In 1996, this operation accounted for only 0.3% of the numbers in the Upper East and 2.7% in the Upper West Regions of northern Ghana (Table 4.7). More recent figures are not available. However, this semi-commercial poultry is considered an emerging rural livelihood diversification strategy, especially in northern Ghana.

Village Poultry Rearers

Village poultry comprising chickens, guinea fowls, ducks and turkey are very important in sustaining livelihoods of rural and peri-urban households. While chickens are predominant in the southern

regions, guinea fowl is the more important species in the three northern regions of the country. However, all the species are kept all over the country (Table 4.7).

Table 4.7 Backyard Poultry Production (1996)

Species	Present in the country (2006)	Significant	Numbers (1996)	Distribution – Geographical	Breeds
Cockerel	+		816,848	All regions, but concentrated in UE, UW, NR	Shaver Starcross 579, Hisex Brown , Starcross 288
Layer	+		NA	NA	
Local Fowl	+	*	3,730,214	All regions	Frizzle, Barred, Naked Neck, Crosses
Turkey	+		141,979	All regions	White, Bronze, Buff locals; California white
Duck	+		385,962	All regions	Muscovy
Geese	+		+	- GAR	
Guinea fowl	+	*	1,185,304	All regions except WR	Pearl. Helmented
Quail	+		NA	GAR	NA
Dove/Pigeon	+		37,	All regions	NA
Song birds	+		330	AR, BAR	Parrots
Wild birds killed	+		NA	All regions	NA
Other			NA		

*Kept/exploited by 1 in 1000 people.
GAR- Greater Accra Region; AR- Ashanti Region; BAR- Brong Ahafo Region
NA- Not available.

As in other African countries, rural poor depend on low input village poultry to provide quick cash to meet several needs, such as to buy food, pay medical bills, school fees and meet other household expenditures. Village poultry also contribute to household animal protein consumption (Karbo et al 2003; Aboe, et al., 2006a, b; Awuni, 2002).

Informal Sector Poultry and Egg Trade

The informal sector constitutes the predominant trading system in the country, although no data is available. Tables 4.8 and 4.9 give some information about this sector.

Table 4.8 Informal Sector Egg production

Actors	Proportion (%)	Numbers	Turnover (eggs/month)	Specialisation
Producers	10	NA	NA	NA
Producer/retailers	20	NA	NA	NA
Wholesalers	2	NA	NA	NA
Wholesaler/retailers	3	NA	NA	NA
Retailers	65	NA	NA	NA

Source: Ghana National Association of Poultry Farmers (GNAPF)

Table 4.9 Informal Sector Chicken Sellers

Actors	Proportion (%)	Numbers	Turnover (eggs/month)	Specialisation
Producers	10	NA	NA	NA
Producer/retailers	20	NA	NA	NA
Wholesalers	2	NA	NA	NA
Wholesaler/retailers	3	NA	NA	NA
Retailers	65	NA	NA	NA

Source: Ghana National Association of Poultry Farmers (GNAPF)

Retailers who purchase poultry and poultry products from farm gates are usually the main egg and live bird sellers. They sell at the wet markets, where there are usually separate sections for live birds and eggs. Some producers sell directly to customers at the farm gate. Some wholesalers also retail, but these constitute a small number.

Table 4.10 Summary of numbers of actors

Breeders	Backyard poultry	Support services
Pedigree pure lines: 0*	Poultry: 7	Feed mills: 2
Great grand parents: 0	Turkey:6	Feed transport : 0
Grand parents: 0	Duck:6	Transport day old chicks:0
Parents: 1	Geese :NA	Firms transporting eggs: 0
Layers:0	Guinea fowl :7	Transport broilers and spent layers to abattoirs: 0
Broilers:0	Quail:1	Egg packing plant: 0
	Dove/pigeon:5	Meat processing plant: 1
	Song birds: NA	Abattoirs: 1
	Wild birds killed for meat NA	Poultry vaccine producers: 0
	Other	Specialized poultry vets:1
Commercial Sector	Informal sector poultry sellers	Informal sector egg sellers
Parent stock :1	Producers:NA	Producers:NA
Hatchery: 1	Producer/retailers NA	Producer/retailers: NA
Rearing : NA	Wholesalers:NA	Wholesalers: NA
Broiler production (i)	Wholesalers/retailers: NA	Wholesalers/retailers: NA
Layer production (ii)	Retailers: NA	Retailers:NA
(i) + (ii) = 4		

* 0:None present in country; 1:1 to 9; 2: 10 to 99; 3: 100 to 999;
4: 1,000 to 9,999; 5: 10,000 to 99,999; 6: 100,000 to 1,000,000; 7: More than 1 million

Table 4.10 indicates that the number of actors in most categories in the poultry sector is unknown (NA). Furthermore, there are none in the breeding sector except for parent stock breeders. The number of broiler and layer producers is less than 10,000 (score 4) and the number of feed millers is less than 100 (score 2).

Description of Actors in the Poultry Sector

Breeders

These actors produce day old chicks from the parent stocks they keep (See Section 4.1.3). Predominantly, they produce layer replacement chicks, with cockerels as by-products. Installed

capacity is up to 20,000. The biosecurity lapses are free entry and exit of materials to and from the farm. Disinfection practices are likely to be satisfactory.

The vaccination schedules practiced on the farms are likely to be those prescribed by the Veterinary Services Directorate (VSD), which include:

- Against Newcastle Disease: Hitchener B1 at 14 days; LaSota at 42 days and Inactivated at 16 weeks;
- Against Gumboro (Infectious Bursal Disease): Intermediate or Intermediate-plus at 7 and 28 days;
- Against Fowl Pox: Fowl Pox live vaccine at 35 and 84 days.

In addition to these vaccinations, antibiotic, coccidiostat and deworming treatments are made according to the farm's previous health records.

The large-scale poultry farmers, in which category breeders fall, usually employ their own health service workers, either full-time or part-time.

Other management practices are summarized below:

- Debeaking: Varies according to farms.
- Use of poultry health service provider:
    - In house veterinary services: NA
    - Private veterinarian visiting farm: NA
    - Private veterinarian supplying drugs: NA
    - Technician: NA
    - Community animal health worker: Not used
    - Other farmers: NA
    - Poultry owner or family: NA
- Where poultry are obtained:
    - Bred on farm: No
    - Bought in: 100%
    - Age bought in: NA
    - Type of supplier: Importing company
- Feeding:
    - Feed given: Typical feed for different ages
    - Source of feed: Own feed mill
    - Marketing: Not available
- Vertical and horizon integration with other actors
    - Breeders operate a partially integrated system: Chain imported day old chicks, operate feed mill, hatchery and marketing outlet.
    - See Figure 4.1.

Commercial Broiler and Egg Producers

Some commercial poultry farmers may keep other species of animals (sheep, goats, cattle, and/or pigs) in addition to poultry. In commercial farms, birds are fully housed, either in deep litter or in battery cages. Commercial farms vary widely in the number of birds they keep, ranging from as low as 50 to as high as 10,000. Farms with smaller numbers of birds usually allow their birds access to fenced chicken runs.

The level of biosecurity operated by these operators is low as wild birds and rodents, other domestic birds and non-poultry attendants have free access to the poultry.

Commercial producers depend on breeder/hatchers and importers for supplies of day old chicks, and commercial feed millers for the various categories of poultry rations. In addition, if they have not employed their own veterinarians, they also depend on animal health service providers of the Veterinary Services Directorate (VSD) for vaccination and other health services. For large-scale poultry farms all day old chicks are obtained from their own hatcheries, whereas medium and small-scale farmers purchase their day old chicks from the hatcheries or importers.

Birds on commercial farms are fed regular poultry rations (starter, grower and finisher/layer) normally obtained from their own feed millers. Some of the small-scale producers mix their own feed from concentrates obtained from importers, wheat bran (sold at the wet market) and vitamin-mineral premix obtained from importers. Small-scale farmers sometimes use fish meal, obtained from importers or at the wet market, to compound poultry feed.

Commercial broiler and egg producers sell all their produce to retailers, fast food operators and consumers. Broilers are mostly produced and sold at the major Christian and Muslim festivities. Eggs and spent layers are sold throughout the year.

- Marketing and other use of poultry products
    - % Sold : 100%
    - Type of buyer: retailers (vendor), fast food operations, consumers
    - Seasonal trends in marketing
    - Eggs: all year round
    - Meat: Peak seasons are Christmas, Easter, Muslim Festivals.
- Vertical and Horizontal integration with actors (See Fig. 4.1).

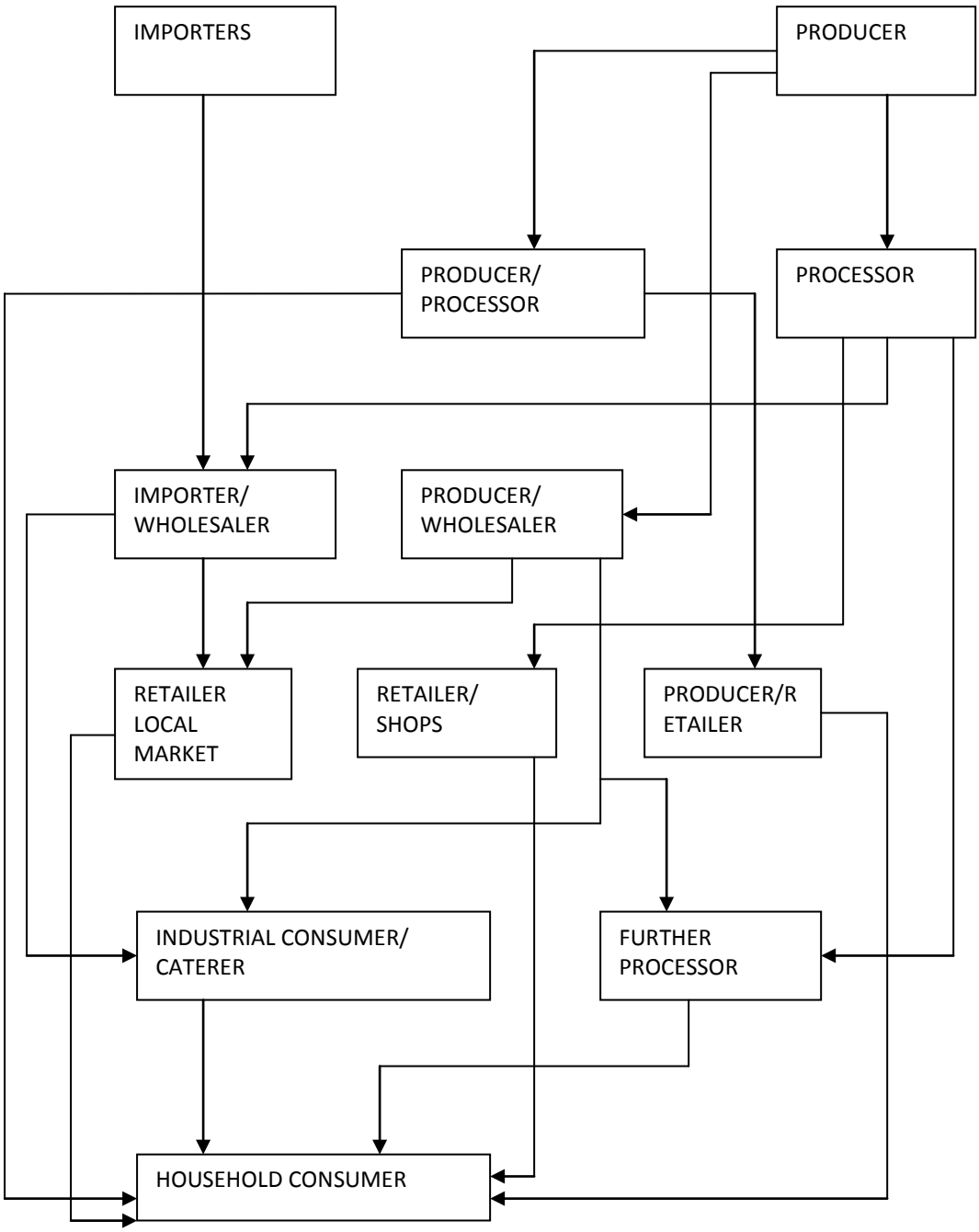
Figure 4.1 shows the channels, structure, players and markets. The majority of small-scale commercial producers sell live birds at farm gate or whole dressed broilers to households and caterers. Village birds are also sold at farm gates or wet markets.

Some small-scale and most medium and large-scale commercial producers process whole birds for sale. The two large producers that processed chicken parts had a combined capacity to process 20,000 birds per day (ADB, 2003). The cost of processing and storage has gone up drastically on account of high electricity tariffs, and this is affecting local operators.

Meat importers play a major role in the wholesale production of poultry meat products. They operate cold storage facilities from which retailers buy in cartons and sell in bulk to caterers and other traders.

Traders go to poultry farms to buy birds which they retail live in wet markets. There is some vertical integration, with some producers selling live at farm gates and processing for retail, through their own outlets, such as their own shops or other shops. Some retailers, especially women who buy frozen poultry from wholesalers, retail them sometimes at the premises of the cold stores. Others sell at the local market, where they have deep freezers.

Figure 4.1 Overview of Poultry Actors in Ghana



Source: G. Ameleke (Unpublished)

Backyard Producers

Backyard producers are those who produce or keep poultry at the homestead. A small subset of these produces a small number of exotic broiler or layer birds for commercial purposes. The birds are provided housing, usually on deep litter outside the owners' dwelling. The poultry house may have a fenced chicken run, but often does not. This category may be included in the small-scale commercial operation.

The second category of backyard producers is the village poultry keeper. Typically chickens, ducks and turkeys are kept in the southern parts of Ghana, and in the north Guinea fowl and chicken are the commonly found species. Numbers kept average at 30 per household (range: 17-54), but may be as high as 100 (Awuni, 2000, Aboe et al, 2006a; Naazie et al, 2007). Birds are housed at night in poultry coops with perches and are allowed to free-range in the day to scavenge.

There is no biosecurity system in place in village poultry and this constitutes a serious hazard for disease spread. They are in contact with wild birds and other poultry, as well as with other species of animals. The major health constraint to village chicken production is Newcastle Disease, vaccination against which has been recently introduced using the I2 vaccine intraocular. This may be performed by the trained farmer or Community Health Workers, who are active in some communities. VSD para-veterinarians are present in or accessible by many communities to provide health care for backyard producers.

Scavenging birds are usually given supplementation with kitchen left-overs, maize, rice or wheat bran, cassava, pito brewers' grain and in the north of Ghana, termites (Aboe et al, 2006a; Karbo et al, 2003).

According to Aboe et al (2006b), 80% of village poultry are sold and 20% are eaten at home. Backyard producers sell live birds to retailers or on the market themselves. They buy supplementary feed from the market.

Interaction among Important Actors

The exchange of poultry inputs and information, and frequency of exchange are summarized in Table 4.11. Exchange of poultry inputs is in the form of drugs, vaccines and premix equipment, whereas the outputs include feed, culled birds, table eggs and cockerels.

The exchange of information includes sharing information on the selling price of products, source of cheaper inputs, effectiveness/advantages or disadvantages of new drugs or feed additives and newly introduced ingredients. Finally, the level of trust is scored on the following: sharing of trade secrets and quality of prepared mash/pelleted feed, etc.

The table shows, for example that commercial rearers have a medium level exchange with backyard rearers (P2). This is usually in the form of exotic cockerels for crossbreeding with village fowls. Information sharing is low (I3) and trust is also low (T3). Frequency of interaction is less than monthly, i.e. occasionally at symposia and conferences. Similarly, feed mills have a low level input exchange (P3) with backyard duck rearers, low information sharing with them (I3), low level trust (T3) and never interact with them.

Table 4.11 Matrix For Actors Identified As Important

		Commercial		Backyard		Support	Informal Egg Sellers		
		Rearing	**Broiler**	**Chicken**	**Duck**	**Feedmill**	**Producers**	**Retailers**	**Wholesalers**
Commercial	Rearing	P3 I1 T2 weekly	P3 I1 T2 Monthly	P2 I3 T3 Less than monthly	P3 I3 T3 never	P1 I1 T1 Weekly	P2 I2 T2 weekly	P1 I2 T2 daily	P1 I2 T2 daily
	Broiler	P3 I3 T3 Less than monthly	P2 P1 T2 Weekly	P2 I3 T3 Less than monthly	P3 I3 T3 never	P1 I1 T1 daily	P3 I3 T3 never	P3 I3 T3 never	P3 I3 T3 never
Backyard	Chicken	P2 I3 T3 Less than monthly	P3 I3 T3 Never	P2 I2 T2 Less than monthly	P3 I2 T2 never	P1 I2 T1 weekly	P1 I2 T2 daily	P1 I2 T2 daily	P1 I2 T2 daily
	Duck	P3 I3 T3 never	P3 I3 T3 Never	P2 I2 T2 Never	P3 I2 T2 Less than monthly	P3 I3 T3 never	P3 I3 T3 never	P3 I3 T3 never	P3 I3 T3 never
Support Services	Feedmill	P1 I2 T2 Weekly	P1 I2 T2 Weekly	P1 I2 T1 Weekly	P3 I3 T2 never	P2 I1 T1 daily	P3 I2 T2 Less than monthly	P3 I3 T3 never	P3 I3 T3 never
	Transport DOC (Actors provide their own transport)	Not applicable							

Source: Ghana National Association of Poultry Farmers (GNAPF)

a) Exchange of poultry/inputs, outputs from column to row (P1 - high, P2 - medium, P3 - low)
b) Exchange of information from column to row (I1 - high, I2 - medium, I3 - low)
c) Level of trust (T1 - high, T2 - medium, T3 - low)
d) Frequency of interaction: daily, weekly, monthly, less than monthly, never

Stability of Actors over Time and Space

Table 4.12 shows the trend of growth or decline of commercial, backyard and support services actors in the poultry sector in Ghana.

Table 4.12 Growth trend of poultry production in Ghana

Actor		Present	Numerical trend	Location	Geographic Trend
Commercial	Rearing	50	Up	Urban	Up
	Broiler	50	Down	Urban	No change
Backyard	Chicken	Always	Up	Rural/Peri-urban	No change
	Duck	Always	Down	Rural	Down
	Guinea fowl	Always	Up	Rural/Peri-urban	Up
	Turkey	Always	Down	Rural/Peri-urban	Down
Support Services	Feedmill	40	Down	Urban	No change
	Transport				
	Day/old	None	-	-	-
	Veterinary	50	Down	Urban/Rural	No change
	Traders	50	Up	Urban/Rural	No change
	Processing	20	Up	Urban	Up

Source: Ghana National Association of Poultry Farmers (GNAPF)

While backyard poultry production appears to be on the rise; commercial, especially broiler production and the support services are on the decline.

Production System and Biosecurity

In Section 3.5, it was indicated that commercial poultry production falls into categories 2 and 3 of the FAO System, in which biosecurity is described as medium to low. Poultry farmers have been sensitized to the need to improve biosecurity practices, especially after the outbreak of AI in the country. At Sydal Farms Ltd., for example, it is estimated that it costs only GH0.13 (¢130) to provide disinfection and dedicated clothing per bird for 17 months, while revenue per bird for the same period is GH¢9.18. (See Appendix 2).

The VSD has produced a Biosecurity Manual for the training of its field staff, poultry farmers and other stakeholders, including traders in live bird markets, processors, pet bird-owners and wildlife workers (Appendix 4). The following estimations of biosecurity risk factors in poultry production in Ghana are based on one of the author's (Prof PK Turkson) personal experiences over the last 10 years.

- Vaccination team covering more than one farm and failing to disinfect between premises: This is potentially a problem. Most commercial farms use in house vaccinations, whereas backyard operators use VSD services. It is unlikely that most of the latter would perform thorough disinfection.
- Vehicles, containers and catching teams used to transport birds not cleaned and sanitized before and after visits: This is a problem in Ghana. Most commercial farms rely on public transport for moving birds and less than 100% of vehicles are effectively disinfected.

- Hatching egg (HE) collection vehicles, equipment, packaging material and staff not cleaned and sanitized before and after visits: This is not likely to cause a serious problem. 100% of breeding farms and hatcheries have their own vehicles and 100% of these are likely to disinfect thoroughly in house.
- Reject egg collection vehicles, equipment, packaging material and staff going from farm to farm: This is not likely to be a problem, since this practice is absent in Ghana.

- The disposal of surplus males just prior to the commencement of lay to workers, markets or backyard industry;
  - This may be a problem. 100% of layer units sell males inadvertently bought at day-old and 100% of buyers will take them to their homes for meat or breeding.
  - The acquisition of replacement males due to a shortage of males during the lay period: This is a problem in this country. 100% backyard operations acquire males as gifts or through purchase for breeding and 100% are unlikely to quarantine them.
- Drivers not following biosecurity procedures:
  - This is a problem in this country. Most of the commercial farmers rely on public transport to move feed, birds and eggs ready for market. 100% village poultry transported in public vehicles and 100% drivers do not disinfect vehicles.
  - Imports of HE and DOC arriving in contaminated vehicles and containers: This is potentially a problem. 90% of commercial producers rely on public transportation for DOC delivery and 100% of drivers do not disinfect their vehicles.
- Disposal of non-hatching eggs, unhatched eggs, culled chicks and contaminated packaging materials. This may be a problem. 100% of hatcheries may not have proper disposal arrangements on farm.
  - Disposal of manure to the environment: This is a problem in this country. 80% commercial farms and 100% backyard producers do not have satisfactory manure disposal system, and 100% dispose of manure just outside farms.
  - Inadequate cleansing and disinfection of vehicles, equipment, bird containers: This is a problem in this country. 90% of commercial farms do not have the necessary staff and 70% are unlikely to practice adequate disinfection of equipment.
- Poor staff hygiene and lack of clean protective clothing needs: This is a problem in Ghana. 100% of commercial farms are not making enough profits to invest in staff welfare and protection, and 80% of the staff do not wear the appropriate protective clothing.
- Depopulation lasting more than 48 hours: This is a problem in this country. 100% of commercial farms make sluggish sales of spent birds and their broilers and 80% of farms will depopulate over one week.
- Birds going to more than two abattoirs: This is unlikely to be a problem. 90% of birds do not go through an abattoir and 100% of abattoir receive birds from more than one farm
- Lack of Integration: This is a problem in this country. Nearly 100% of farms receive DOC, feed and drugs from different actors.
- Different age groups of birds on any one farm: This is a problem in Ghana. 100% of farms keep multiple groups of birds.

5. Poultry and Rural Livelihoods

Livelihood patterns and strategies in Ghana are typically linked to the ecological zones. Livestock keeping, rain-fed and subsistence agriculture are the main livelihood strategies in the country. The correlation between ecological zones and the types of livelihood strategies undertaken are because different natural resource endowments or assets (e.g., water, livestock species, feed etc) are available in different ecological zones, and the specific livelihoods strategies communities adopt in order to meet their livelihood objectives are based on their asset base. For example, the Guinea and Sudan Savanna zones that are characterized by a single rainy season, long drought periods and savanna grassland have different species of livestock (including poultry), crop farming, fishing and agro-processing as major livelihood strategies. In contrast, the forest zone of the middle-belt and the south (including the Coastal savanna) with two rainy seasons and a short duration of drought have commercial poultry keeping, petty trading and food service as prominent livelihoods strategies.

There are very few studies that have investigated the role of poultry in rural households' livelihoods outcomes, such as income and nutrition. Blackie (2006) conducted a study on the role of scavenging local chicken in rural household livelihoods in the Greater Accra Region. This study found that the major reason households stated for keeping chicken was for food security, as chicken provided both meat and eggs. Keeping chicken for income purposes was a minor reason. This finding could be attributed to the small average flock size of about 13 birds per household. The study also estimated that most rural households in the sample depended on fish as the major source of animal protein (96.07%), and that the contribution of chicken to household animal protein intake was only 2.71%. In terms of its contribution to household income, the study estimated that local chicken contributed about 5.1% on average to the household annual net income.

In a similar study, also conducted in the Accra Plains of Ghana, Aboe et al. (2006a) found that over 80% of respondents kept free-range village chicken to supplement their income. The study found that most households receive income from chicken sales, which contribute an average of about 15% to total income.

The intra-household ownership and decision making with regards to poultry was investigated in a document by MOFA/DFID (2002) on the role of livestock in rural livelihoods in Ghana. This document was on the household members' roles in poultry management according to their gender. Typically, the cleaning of pens is a female activity, while the males generally take charge of the construction of pens (housing), sale of live birds and slaughter. However, marketing of eggs is a predominantly female activity.

Another study which investigated the role of gender in poultry management and ownership is by Naazie et al. (2007). This study found that in the Upper East Region of Ghana, poultry is generally owned by any member of the household, both males and females. Women, however, are not able to publicly declare ownership since the husband "owns" everything in the household. The responsibility to care for the poultry follows ownership patterns, and the females tend to primarily care for the birds (mainly feeding, watering and housing) since the males are usually not at home. Naazie et al. concluded that money from the sale of poultry is the primary reason for keeping poultry, and marketing of poultry is no longer an activity reserved only for males. This study also stated that poultry represents a great asset for poverty reduction because their lower costs of purchase as well as lower input costs compared to other livestock allow poultry to be owned by everyone.

The important role of poultry in culture, religion and tradition is undisputable. Gueye (2005), for example, states that in Africa general statements on ownership can be misleading because there are different modes of acquisition of poultry (gift, inheritance, etc), and the ownership of poultry is usually an outcome of the socio-cultural and religious realities of any particular society. In Ghana, similarly to other African countries, live birds, including chicken, guinea fowls and turkeys, feature prominently during festivals and celebrations as they are used extensively to prepare both traditional and modern dishes for the household. In addition, live birds of all species may be given as gifts to prominent individuals or key family members on special occasions. .

Colecraft et al. (2006) studied the constraints in the use of animal source foods for young children in Ghana across all the major ecological zones (Coastal Savannah, Forest Transition and Interior Savannah zones) and concluded that there were marked similarities in the reasons for livestock-rearing across all agro ecological zones, rural and semi-rural communities, and wealth ranks. Their results reveal that home-reared livestock were slaughtered mainly for celebrations (weddings, religious festivals, funerals, etc) but rarely for everyday household food consumption. Sales from livestock (including local poultry) supplemented income from crop farming, and also provided money for paying school fees, medical bills, funeral expenses, and solving problems during crisis. Even though fish consumption was universal and was ranked as the most frequently consumed protein source because it was relatively cheaper, chicken in the interior and coastal savannah and guinea fowl in the interior savannah were also commonly consumed.

Finally, seasonality and disease issues related to rural poultry were investigated in a study by Awuni (2000). This study found that rural poultry production systems in Ghana are generally based on the indigenous scavenging domestic fowl, which represent about 80% of the estimated 20 million poultry in Ghana. The results of the field surveys conducted during the study revealed that in the wet season there was a significantly lower hatchability of eggs incubated with corresponding low chick survival rates compared to the dry season. However, in both coastal and forest zones, most of the mortalities of the rural chicken occurred during the dry season; and as much as 80% of the birds could be lost due to outbreaks of Newcastle disease and other factors.

6. Previous HPAI Research and Findings in Ghana

HPAI knowledge in Ghana

To date, there is no comprehensive published report on the status of HPAI in Ghana. There are, however, some reports and documents from the Avian Influenza Working Group (AIWG) and the Veterinary Services Directorate (VSD) of the Ministry of Food and Agriculture (MOFA), summaries of which are presented below.

Avian Influenza Working Group (AIWG)

A number of reports available from the AIWG provide information on the status of HPAI in Ghana, both before and during the outbreaks of 2007. This section draws heavily from 5 reports made available by AIWG through Dr. W Ampofo. These reports are:

- USAID (Ghana)/Quality Health Partners (2006) A case study: Ghana's response to the threat of Avian Influenza.
- Woodfill and Gaturuku (2007) Draft report on Avian Influenza preparedness and response in Ghana.
- USAID/CDC/NAMRU-3 (2007) Avian Influenza Needs Assessment and Technical Assistance. Brong Ahafo and Ashanti Regions, Ghana Trip Report.
- Ahadzie (2007) Avian and Human Influenza pandemic preparedness in Ghana. Interagency Workshop Presentation.
- Marchot (undated and untitled draft on AI in Ghana).

Information from these documents reveal that Ghana started putting in place mechanisms for the prevention of the entry of the disease and also for the early detection and response (should the disease enter the country) even before there were reported cases of HPAI in Ghana. An inter-sectoral, inter-ministerial and inter-diciplinary National Avian Influenza Working Group (AIWG) was established in September 2005 by the Ministries of Food and Agriculture, Health, Lands, Forestry and Mines and Interior in conjunction with key local partners (Food and Agriculture Organisation (FAO), World Health Organisation (WHO and the United States Agency for International Development (USAID)) to plan activities and review the HPAI situation.

The AIWG developed and released Ghana's "Preparedness and Response Plan for Avian and Human Pandemic Influenza," which detailed the necessary actions that should be undertaken to tackle the disease in poultry, other animals and humans. The Plan covered issues of planning and co-ordination, surveillance, prevention and containment, health systems and communication. This Plan was developed following a rapid assessment which was done in October and November 2005 at national, regional and district levels. This assessment critically reviewed key systems for diseases in animals and humans, and disaster preparedness and management.

In addition to the endeavours of the AIWG, a ban was imposed on the importation of live poultry and poultry products from countries which reported cases of HPAI as of March 26, 2006. With the

outbreak in Nigeria, there was a complete ban on the entry of live poultry and poultry products through the eastern corridor of the country, while the global situation was monitored intensely.

Local and international press reports on HPAI, especially when the disease spread to the West African sub-region in 2006, caused panic among the public. Communication of the accurate and up to date messages to the public was challenging, however efforts were made to reassure the public and keep them informed and alert through systematic and effective campaigns. Awareness was created through several channels, including radio and television discussions, the production of leaflets, education of farmers and production of an HPAI documentary that was used by the Information Services Department to educate the public. Another challenge was the coordination of activities and sharing of tasks between agencies and departments for the various sectors to work together. To this end, Regional and District Co-ordinating Committees were formed.

On the human pandemic preparation side, the Noguchi Memorial Institute for Medical Research was designated as the National Influenza Centre, even before the emergence of HPAI in Ghana. Two scientists from this Institute were trained in Cairo, Egypt, in influenza diagnosis and virus characterization. A real time polymerase chain reaction (PCR) machine and reagents were purchased with the support of United States Naval Medical Research Unit-3 (NAMRU-3) in Cairo, Egypt. HPAI surveillance guidelines were developed and used in the training of regional teams. The isolation units of the regional hospitals were identified and equipped to handle human flu cases. Also, 500 sets of personal protective equipments (PPEs) were procured, distributed and staff were trained in their use. In January 2007, 10 sets of PPEs were distributed to each of the regional hospitals, the two teaching hospitals in Accra and Kumasi and the 37 Military and Police Hospitals in Accra. In case human cases arose, 105,000 capsules of the anti viral agents TAMIFLU were procured and distributed to the regions by the Ghana Health Service (GHS) of the Ministry of Health (MOH) in early April 2007.

Veterinary Services Directorate

The Veterinary Services Directorate (VSD) of the Ministry of Food and Agriculture (MOFA) in Ghana have been involved in activities to prevent and control HPAI H5N1 with support from several donour agencies such as the Food and Agriculture Organisation (FAO), United Nations Development Programme (UNDP), United States Agency for International Development (USAID) and Germany's Gesellschaft fuer Technische Zusammenarbeit (gtz), to name a few.

According to the AIWG reports, as part of the implementation of the Preparedness and Response Plan, VSD has been carrying out active surveillance before the emergence of HPAI in Ghana. The summary of the USAID/Quality Health Partners (2006) document findings on the active surveillance for HPAI in Ghana is cited below:

> *Although overt avian influenza disease has never been reported in Ghana, the scare has raised its public health importance in Ghana. In 2006, the Veterinary Services Department in collaboration with Wildlife Division of the Forestry Commission initiated an active surveillance for avian influenza virus in commercial, free range (scavenger), wet market and migratory birds in Ghana. The objective of the study was to determine AI infection and disease among domestic and wild birds in Ghana through active surveillance for appropriate action.*

The entire country was divided into four operational zones. In each zone, flocks were purposely selected based on perceived risk of Avian Influenza; the risk being dense poultry areas, wet markets, staging/landing sites of migratory birds and communities that bordered landing sites. Estimation of sampling flock sites was based on an expected prevalence of 1% in the poultry population in the country with the assumption of infinite number of flock sites. The total flock sites selected for sample collection per region was based on 1996 poultry population distribution. Having the flock as the study population, a bird in a commercial farm, wet market, bird in a household or compound in the villages or a migratory /wild bird was used as the sample unit. Sample sizes were determined from a table, with confidence level set at 95% for detecting at least one case of disease for various expected prevalence values and flock sizes. Four types of flock groupings of birds were surveyed namely: Commercial, Backyard, Migratory and Live Bird Markets. A checklist system was employed for the identification of individual birds showing any signs and symptoms of avian influenza.

Specimens (tracheal, cloacal and faecal) for the active surveillance were taken from sampled birds. Virus isolation was done according to the method recommended by OIE. In brief, a cloacal and/or tracheal swab in antibiotic-containing transport medium was centrifuged. Supernatant was collected and inoculated into 9 to 11-day-old embryonated chicken eggs intra-allantoically. The eggs were incubated for 4 days; afterwards allantoic fluid was harvested and tested for Haemagglutination (HA) activity. Haemagglutination test was performed by the method as recommended by OIE. Newcastle Disease (ND) diagnostic assays were performed in parallel with AI in order to rule out ND infection.

An insignificant number of the birds sampled showed the following signs and symptoms: marked depression, swollen and dark comb, ataxia, rattling sound of respiration, cessation of egg production, stretching of neck, watery stools, swollen conjunctiva, lack of appetite, ruffled feathers, increased mortality of birds, sneezing, torticollis and excessive thirst. Apart from watery stools that recorded 1.1% (CI 95%: 0.65-1.5) of birds examined, the rest of signs of AI were below 1% prevalence. None of the birds had swollen wattles or haemorrhages on shanks.

None of the 1995 samples (cloacal and tracheal swabs) collected throughout the country were positive for AI virus infection. From the current clinical and laboratory investigations (active surveillance) together with passive surveillance conducted for avian influenza, we can conclude that there is no scientific evidence of avian influenza infection in Ghana as at now.

In addition to the endeavours explained in the above extract, there was also surveillance of migratory birds in seven wetlands and the samples taken were all negative for HPAI H5N1.

There are also a number of projects which implemented various activities to provide the relevant stakeholders and the general public with information pertaining to HPAI and minimization of HPAI risk. Summaries of these projects are presented in the paragraphs below.

1. The “Avian influenza prevention and control in Ghana” project was funded by the FAO’s Centre for Crisis Management in 2007. The major activities included educating poultry stakeholders (poultry farmers, traders, and processors of poultry products); Customs, Excise and Preventive Services officials and the police force located in the HPAI outbreak foci and other regional capitals on biosecurity issues. The duration of this project was from June to December 2007. As part of this project, biosecurity workshops were organised in all of the 10 regional capitals. Poultry stakeholders, including some smallholders, attended these workshops. An impact assessment of these workshops is yet to be done. Within the capacity of this project, a Regional Simulation Workshop for Anglophone West African countries for the control of Avian Influenza was held in Accra from October 9-11, 2007. During this workshop, lessons learned from the control measures in Ghana were shared with other countries in the region.

2. “Strengthening avian and human influenza preparedness through awareness raising and capacity development for pursuing alternative livelihoods for the affected populations.” This project is funded by UNDP and is being implemented by VSD through the FAO. This project has just started, hence there are no results to date. The expected outcomes of this project include (i) preventing further spread of HPAI and its transmission to humans and (ii) reducing the potential socio-economic damage through the provision of a capacity development programme for affected populations to pursue alternative livelihood strategies. The expected outputs include (i) enhancement of the understanding of HPAI control among poultry farmers, producers and buyers; (ii) alternative livelihood strategies analyses; and (iii) capacity development programmes for poultry farmers and producers to pursue alternative livelihood strategies.

   Under the first output, which is on-going, the methods and approaches employed are dissemination of accurate information on the national compensation scheme through printing and distribution of flyers/leaflets and holding of information sessions on the compensation scheme, production and distribution of information materials on HPAI, conveying of key HPAI messages to targeted audiences in priority regions and conducting of HPAI campaign using audio-visual materials specifically designed for those involved in poultry business.

   Under the second output, which is expected to start in 2008, the methods and approaches employed include the implementation of two studies on the poultry industry census and the socio-economic impact of HPAI. The specific activities pertaining to the census encompass collection and analyses of data on a number of poultry farms in Ghana, geographical distribution of poultry entities at district level, types and numbers of poultry, types of poultry farming systems using the FAO classification system, poultry management systems, poultry health management and poultry off-takes. The specific activities for the socio-economic impact study include collection and analyses of baseline data, market analyses of other livelihood strategies and stakeholder consultative meetings.

   Under output 3, which is expected to start following the delivery of the second output, the method and approaches envisaged include conducting a study on capacity development in alternative livelihood strategies for poultry farmers and processors. The activities involve stakeholder consultations, designing of training courses on alternative livelihood strategies suitable for different geographical conditions, production of training manuals/tools, pre-testing or pilot programmes and providing training sessions for poultry farmers and traders.

3. "Prevention and control of Avian and Human influenza in Ghana through the Support Programme to Integrated National Action Plans for Avian and Human Influenza (SPINAP-AHI)" funded by EU/AU-IBAR. This project is yet to start. The overall objective is to reduce the socio-economic impact of avian and human influenza and the potential loss of human lives by preventing and controlling HPAI in birds as well as preparing for a possible human influenza pandemic.

   The expected results are (i) the improvement of the HPAI early warning and rapid response capacity in Ghana, (ii) re-establishment and maintenance of Ghana's HPAI-free status, (iii) maintenance of general public awareness on HPAI issues and (iv) the training of poultry farmers in biosecurity issues.

The activities that will be carried out to achieve the abovementioned results include:

1. HPAI Early Warning and Rapid Response Improved:

   - Improve monitoring of poultry farms, poultry population and poultry products;
   - Strengthen domestic poultry and wild birds' epidemiological surveillance and reporting systems;
   - Improve response to HPAI outbreaks.

2. Ghana HPAI free status re-established and maintained:

   - Conduct training of senior veterinary staff on OIE guidelines for surveillance of AI;
   - Conduct training of field surveillance teams on implementation of surveillance plan, sampling procedures and correct reporting;
   - Conduct purposive surveillance in identified farms/backyards (sector 2, 3, 4);
   - Monitor surveillance activities;
   - Procure laboratory reagents and equipment for HPAI diagnostics.

3. General public awareness on HPAI issues maintained and poultry farmers trained on bio-security issues:

   - Train public senior veterinary staff and private veterinary practitioners in appropriate HPAI communication on bio-security in poultry production and marketing;
   - Produce and distribute awareness materials on HPAI and bio-security in poultry production and marketing;
   - Advertise guidelines on HPAI prevention and control;
   - Train media personnel on bird flu prevention and control;
   - Train 50 poultry farmers and poultry traders on bio-security in the poultry industry;
   - Strengthen the Avian Influenza Working Group (AIWG) and improve briefings of the mass media on HPAI issues.

7. Threats and Incidences of HPAI and Institutional Response Capacity

Newcastle disease (NCD) is a major poultry disease in Ghana, which is of comparable epidemiology to HPAI. NCD is endemic and it is controlled by vaccinations given to broilers at 2 and 6 weeks of age and to layers at 2, 6 and 14-16 weeks of age. The local poultry are given a thermo-stable vaccine I2, following a national campaign. NCD is one of the major diseases identified under the Pan-African Programme for the Control of Epizootics (PACE) project for control in Ghana on a countrywide basis.

In addition to NCD, Gumboro is another poultry disease reported in Ghana. Prevalence of these diseases is not known. For both of these diseases vaccinations are available both through public (VSD) and private veterinary providers. The effectiveness of the vaccines is generally very good. Low pathogenic AI and poultry campylobacter have not yet been reported in Ghana.

African Swine Fever (ASF) is another livestock disease which has occurred in Ghana recently, and similarly to HPAI, it is explosive in nature. ASF outbreaks took place in October 1999 and were successfully controlled by the VSD, which was supported with funds from the FAO. The factors which contributed to the successful control of ASF included the high level of professionalism and commitment of the VSD staff; the political support for the slaughter policy, which was backed by the availability of funds for payment of compensation; the support of donours who provided funding and technical expertise; the quick response to the outbreak by using a slaughter and burn/bury policy followed by disinfection to stem the spread of the disease; the cooperation of the affected farmers, and the high level of awareness created by education of farmers and public on the actual and potential impacts of the disease on the pig industry. Altogether, these experiences have proved to be helpful in the preparations for minimizing the risks of HPAI outbreaks in Ghana.

VSD was relatively well prepared before the outbreaks of 2007, as a number of trainings had already taken place. The endeavors to minimize the HPAI outbreaks are explained in greater detail in section 6 above. Marchot (undated) summarizes the efforts made in 2006 in this regard as follows:

> *Active surveillance and mass sensitization of the population have been embarked upon. Awareness creation is on-going nationwide through all the media networks in the country. Posters and other education materials have been designed, printed and distributed to all stakeholders. Three workshops for training of veterinarians (both public and private sectors) have taken place in January, February and December 2006.*
>
> *In addition, a small number of MOFA staff has received both local and international training in the diagnosis of AI, with particular reference to differential diagnosis with Newcastle Disease. An AI diagnostic unit has been set up at MOFA and has been equipped to conduct virus detection.*
>
> *Out of a 2.5 billion cedis envelope, the Government of Ghana (GoG) has financed two workshops for the training of all veterinarians and other staff who are currently creating awareness among the Ghanaian population, especially in the rural areas. From this amount five pick-ups, protective clothing and disinfectants were also*

purchased. Other requisites such as laboratory equipment, biologicals, chemicals and reagents have been purchased with GoG funds.

Development Partners in Ghana have supported the GoG to conduct active AI surveillance and awareness creation throughout the country. For instance, the FAO has supported GoG with $45,000 for the purchase of protective clothing, and the conduct of workshops for laboratory and epidemiology staff.

USAID sponsored MOFA/VSD with €35,000 to carry out active search for AI in Ghana. A total of 1,995 samples from domestic birds and wildlife birds were collected and tested and no positive case of HPAI was detected.

€6,600 was provided for reagents through the EDF financed PACE programme.

The African Development Bank (AfDB), under the auspices of AU IBAR, supported MOFA/VSD in 2006 with €235,000 to organise workshops for all veterinarians in Ghana, and laboratory staff; provide funds for all Regional and District Veterinary Officers to undertake active search for AI; create awareness and educate the general public on AI. Part of the funds was used to produce posters and flyers on AI for further awareness creation.

HPAI situation in Ghana and neighboring countries

Threats/incidence of HPAI in Ghana

On April 24th 2007, the VSD detected potential AI H5 virus infection on a small-scale poultry farm located at Kakasunanka in the Tema Metropolitan area of the Greater Accra Region. This virus was detected by using the rapid test kit for influenza type A viruses. On April 26, 2007, the Emergency Preparedness Team of VSD destroyed the in-contact birds of the infected poultry farm on site. Further tests were carried out at the Accra Veterinary Investigation laboratory on April 28, 2007. These tests were carried out by using HA/HI and the test results indicated the presence of the H5N1 virus. Further tests conducted at the Noguchi Memorial Institute for Medical Research (NMIMR) in Legon confirmed the presence of the disease. Bans were placed on the movement of poultry and poultry products in the outbreak area. At the same time, samples were sent to the International Reference Laboratory for NCD and HPAI at Instituto Zooprofilattico Sperimentalle delle Venezie, Padova, Italy and the United States NAMRU-3 in Cairo, Egypt. Tests done at these international laboratories confirmed the case as positive. Following this confirmation, on April 29, 2007, the VSD Emergency Preparedness Team destroyed all poultry in the focus of the outbreak, resulting in the culling of 1,944 poultry, including 4 ducks.

An active search for the HPAI virus started in the Tema area on April 30, 2007. A total of 64 farms were inspected and samples were collected. By May 3, 2007, positive cases were detected on 3 farms at Adjei Kojo, a suburb of Tema. These were at Letap farms, Coker-Appiah's farms and Robert's Farms. A total of 21,622 birds were destroyed on the affected farms. Other positive cases were detected at Nungua Farms in the Tema Metropolis on May 27, 2007. All poultry within a 3km radius were destroyed and quarantine restrictions were placed on all farms within this radius. The culling zone was extended to 5km and then to 8km. In total, 7,999 birds were destroyed on these

farms by May 29, 2007. The sale and movement of poultry was banned in the Tema Metropolitan Area.

On May 15, 2007, another outbreak was detected on the farm of a backyard poultry farmer at Asuokwa, New Dormaa in Sunyani in the Brong Ahafo Region. The results of the rapid tests, HA/Hi tests and Reverse Transcript-PCR (RT-PCR) carried out at the NMIMR were all positive for H5N1. An active search (including sampling) of all poultry farms within the area revealed only one farm with positive results. A total of 2,629 birds, including local fowls and other poultry, were culled. In addition, eggs and feed present on the affected premises were destroyed.

The third outbreak occurred at Aflao, in the Ketu District of the Volta Region on the June 13, 2007. Rapid tests, HA/Hi tests and Reverse Transcript-PCR (RT-PCR) done at NMIMR gave positive results for H5N1. A total of 1,357 birds were culled and eggs and feed present on the premises were destroyed. During these outbreaks, the MOFA declared the Tema Metropolis, Sunyani Municipality and Aflao in the Ketu District as infected zones according to the Diseases of Animal Act, 1961, Act 83. The measures instituted by MOFA included a ban on the movement of poultry and poultry products in and out of the infected area, closure of wet poultry markets in the area, quarantine of the infected farms, active search for the disease in the area and beyond and disinfection of infected premises and farm machinery and equipment.

The source of entry of HPAI in Ghana has still not been traced. According to the VSD (2007), there is a close resemblance (96%) between the virus circulating in Ghana and other HPAI viruses causing outbreaks in the West African region. According to Marbett (2007a), the virus strain in Ghana was between 98.8 and 99.6% similar to other isolates from Cote d'Ivoire, Burkina Faso, Nigeria and Sudan.

According to the VSD (2007), since the last outbreak in June 2007, there have been no suspicious cases or reports of unusual deaths (very alarming mortalities) reported from anywhere in Ghana.

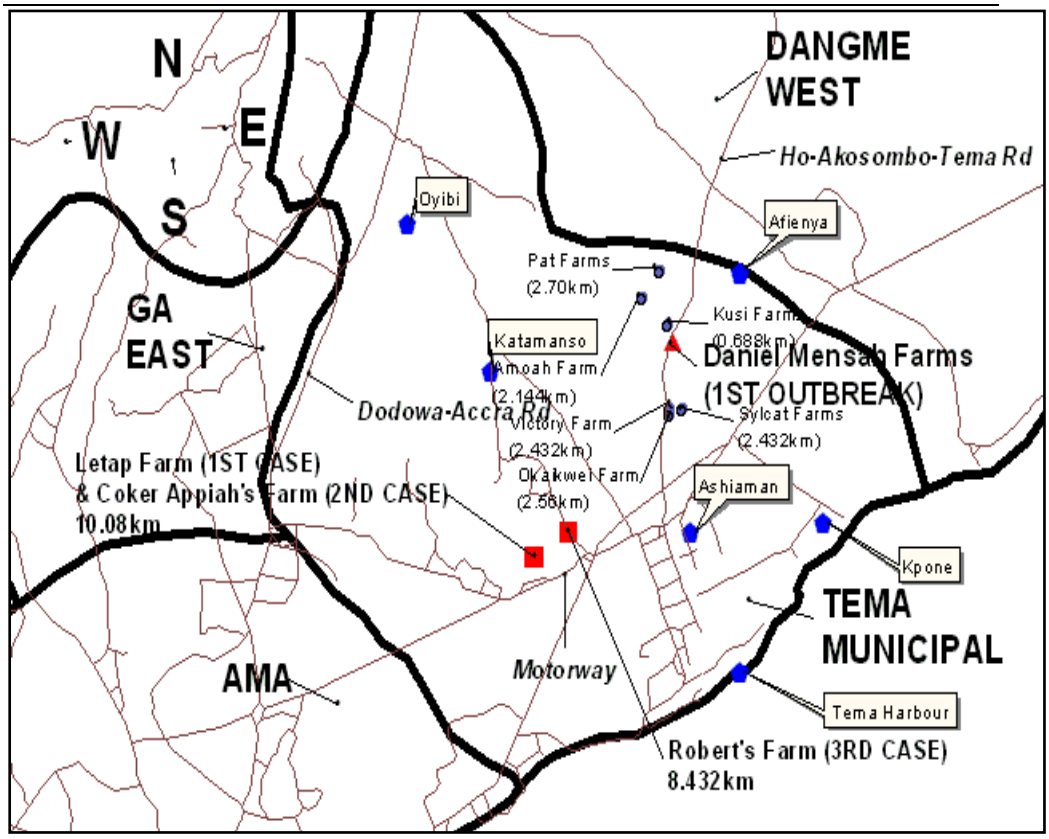
The Action Plan for Avian and Human Pandemic Influenza 2007-2008 noted that the detection of the H5N1 virus in poultry and the subsequent measures to contain the outbreaks in Ghana were highly successful as a result of the improved animal and human health systems put in place, according to the 2005-2006 HPAI National Preparedness Plan. The emergency actions undertaken during the outbreak were facilitated by government dedication and funding, as well as by additional technical and financial support from various international donours including the USAID, FAO and WHO. The outbreaks are summarized in Table 7.1 below. A map of the first outbreak areas is shown below in Figure 7.1, and Appendix 5 shows a map of the outbreak areas.

Table 7.1 Summary of HPAI outbreaks in Ghana

	Outbreak 1	Outbreak 2	Outbreak 3
Date of Outbreak	14 April 2007	11 May 2007	13 June 2007
Types of farms affected	Sector 3 and 4 farms	Smallholder	Smallholder
Areas affected	Kakasunanka, Tema	New Dormaa, Sunyani	Aflao, Ketu.
Diagnostic tests used	Rapid Antigen Hemagglutination Hemagglutination inhibition RT-PCR	Rapid Antigen Hemagglutination Hemagglutination inhibition RT-PCR	Rapid Antigen Hemagglutination Hemagglutination inhibition RT-PCR
Diagnostic test result	Positive	Positive	Positive
Numbers of birds died of HPAI	12811	210	350
Numbers culled	22301	2672	26330
Numbers vaccinated	Prohibited	Prohibited	Prohibited
Vaccine used	Prohibited	Prohibited	Prohibited
Other control measures	Stamping out Quarantine Movement control Disinfection No treatment of infected birds	Stamping out Quarantine Movement control Disinfection No treatment of infected birds	Stamping out Quarantine Movement control Disinfection No treatment of infected birds
Effectiveness of control	Very effective	Very effective	Very effective

Source: VSD (2007); World Animal Health Information Database (WAHIS, 2007)

Figure 7.1 Map of first outbreak areas for HPAI in Ghana (source VSD, 2007)



There were also efforts undertaken on the human health side. During the outbreak in Tema, the Tema Municipal Health Directorate actively screened 69 persons living and/or working on the affected farms, as well as o 29 VSD staff engaged in the culling of poultry. Fortunately, none of the persons under surveillance developed flu-like symptoms (Woodfill and Gaturuku, 2007).

Outbreak Assessments

The USAID, Centres for Disease Control and Prevention (CDC) and NAMRU-3 visited the Ashanti and Brong Ahafo Regions in 2007 following the outbreaks. In the trip report, the strengths and weaknesses of the poultry surveillance, outbreak response and human surveillance mechanisms are explained in great detail and some recommendations are made. The following subsections summarize the main findings of this report.

Poultry Surveillance: Strengths

The strengths of the surveillance were as follows:

- Just prior to the outbreak, the Brong-Ahafo region benefited from effective communication regarding HPAI risk via the mass media, and in particular radio.
- Poultry farmers in Sunyani Municipality had some MOFA training on the appropriate biosecurity measures. Dormaa District, which is near Sunyani, is a model for best practices in poultry production measures. In that District, active surveillance is being carried out; appropriate biosecurity measures are encouraged and the poultry farmers association is strong.
- Ashanti Region has active syndromic surveillance, as well as sensitization of live poultry market workers.

Poultry Surveillance: Weaknesses

The weaknesses of the surveillance mechanisms were as follows:

- Lack of standard operating procedure (SOP) for surveillance activities.
- Routine record keeping is only done by about half of poultry farmers in the Ashanti and Brong Ahafo regions.
- Lack of staff confidence in collecting and handling samples.
- Lack of sampling materials and rapid antigen test kits for rapid presumptive diagnoses.
- Lack of training in the use of PPEs.
- Lack of funding to support fuel costs and other logistics for surveillance.
- In Sunyani, poultry farmers and technicians were found to lask knowledge and training regarding the control of HPAI.

Poultry Surveillance: Recommendations

Recommendations for effective and efficient poultry surveillance are as follows:

- Development of a standard operating procedure (SOP) on methods of active surveillance that can be nationally used.
- Training of veterinarians and technical officers on surveillance, sampling, reporting, and use of PPE (USAID supported training courses took place in Sunyani, Kumasi, Accra, and Tamale in June 2008).
- Workshops with all stakeholders on disease recognition and reporting.

- Supply of material (e.g., PPEs, disinfectant etc) and other equipment (e.g., GPS, communication equipment).
- Provision of rapid diagnostic kits and basic equipment for sample collection and transportation.
- Development of educational materials for poultry farmers' associations based on the experience of poultry farmers in Dormaa District and other resources.
- Active surveillance around outbreak areas and on live bird markets through clinical surveillance (with or without sample collection) and sampling of sick chickens where feasible.
- Strengthening of passive surveillance countrywide, including the surveillance of the wild birds.
- Standardized material for farm record keeping and training of farmers.
- A budget request should be made for sampling materials, fuel costs, logistics and rapid antigen test kits for surveillance activities.

Outbreak Response: Strengths

The identified strengths of the outbreak response and disease control mechanisms include the following:

- VSD is currently conducting stamping out procedures of poultry within a 3km radius of the infected farms.
- The government of Ghana is providing compensation for culled birds.
- The re-use of egg crates has been banned in Kumasi, Dormaa Ahenkro, and apparently in other areas as well.

Outbreak Response: Weaknesses

The weaknesses of the outbreak response and disease control mechanisms are:

- Cleaning and disinfection of poultry farms are not always properly managed.
- Movement control of live birds and eggs is not always respected.

Outbreak Response: Recommendations

Recommendations for effective and efficient outbreak response are as follows:

- Training of public and private veterinary services staff in Sunyani. Training should include the following topics:
  - Clinical signs of HPAI and differential diagnostic with other similar poultry diseases;
  - Necropsy and sample collection;
  - Use of PPE;
  - Use of rapid test kits;
  - Labelling samples.
- Development, dissemination and training of veterinary teams on Standard Operating Procedures.
- Implementation of quarantine and standstill measures as necessary.
- Implementation and enforcement of movement control of poultry and poultry products.
- As movements of birds and poultry products are difficult to control, development of a preventive trans-boundary program is necessary.

- Promotion of bio-security measures on farms, possibly including a ranking system.
- Development and implementation of public awareness and educational campaigns, targeting various stakeholders, including, but not limited to poultry farmers, owners of backyard chickens, traders and school children.

Human Surveillance: Strengths

The strengths of the human surveillance mechanisms are as follows:

- Public health leadership in Brong-Ahafo Region is strong and engaged in HPAI issues. This was observed at the regional, municipal (Sunyani), and district levels (Berekum).
- Ghana has a functional Integrated Disease Surveillance and Response System (IDSR) at the sub-district level, which could incorporate AI H5N1 case reporting.
- The Community Based Surveillance Volunteers (CBSV) programme can be utilized for syndromic surveillance of HPAI in humans and poultry.
- Surveillance system utilizes other community based methods for syndromic surveillance including prayer camps, traditional herbalists and licensed chemical dealers.
- Referral hospitals of Sunyani Regional Hospital and Komfo Anokye Teaching Hospital have a Public Health Unit to support surveillance reporting.

Human Surveillance: Weaknesses

The weaknesses of the human surveillance mechanisms are as follows:

- Health worker sensitization has had little time to take effect. There is limited awareness among health care workers regarding the recognition, diagnoses, and reporting of suspected human avian flu cases.
- There is a lack of official training by the GHS of surveillance officers and health care workers on the use of material and equipment.
- There is an uneven awareness of HPAI reporting mechanisms in the country (e.g., case definition, mechanism for reporting).
- The community health volunteers system should be modified to encourage reporting of suspicious HPAI cases in the area.
- PPE with proper training or post-exposure prophylaxis Oseltamivir should be provided to farmers involved in disinfection of the infected farms.

Human Surveillance: Recommendations

Recommendations for effective human surveillance are:

- There needs to be HPAI sensitization of surveillance officers and health care workers.
- A standardized, national SOP is needed for surveillance, including standardization of case definition, methods for reporting and methods for referral.
- A system should be developed to utilise CBSV as part of the HPAI surveillance for both human and poultry outbreaks.
- Poultry workers need to be given appropriate PPE and training if they are to be involved in culling and disinfection activities.
- Anyone who has been in close contact with HPAI H5N1 infected poultry or contaminated material (i.e.: routine poultry care, culling, disinfection of premises) without wearing appropriate PPE should be given Oseltamivir prophylactically, according to the WHO guidelines.

- The mission conducted sensitization for 50 health workers in Sunyani Regional Hospital, 10 district health workers in Berekum, 20 medical officers at Komfo Anokye Hospital. There is a need for similar activities on a larger scale in the two regions.
- Public education campaigns on AI are needed in Brong-Ahafo. Previous and current education campaigns have focused on the veterinary health side and on washing hands. More emphasis should be placed on adding appropriate human health messages, such as "do not touch sick or dead birds," "eat only well cooked poultry products," "wash your hands after touching chickens", and "go to you health care facility if you have a fever/cough/sore throat after being in contact with sick/dead birds."

Evidence for unreported or undetected HPAI

The opinions of experts from the FAO and Veterinary field staff suggest that a few cases may go unreported as a misdiagnosis of Newcastle disease. However, it is claimed that the alarmingly high mortalities associated with the disease may make it difficult for HPAI cases to go unreported except in isolated areas with no veterinary coverage.

There are concerns on the use of vaccination in neighboring countries, specifically in Cote d'Ivoire, which could mask HPAI outbreaks in Ghana. Even though Ghana has a "No HPAI vaccination" policy, there is information that some farmers in neighboring countries were unofficially vaccinating their birds. According to Marangon et al. (2007), if protective vaccination is to be used during an HPAI epidemic, there is the need for proper management of early detection of any HPAI affected flocks. Furthermore, it is fundamental for disease control and eradication purposes that the capacity exists to discriminate between infected and vaccinated birds and flocks. Unfortunately, this capacity is currently non-existent in the West African sub-region.

Current situation of HPAI in Ghana

After the three outbreaks in Ghana in 2007, there have been no further outbreaks. The country is in a state of high alert because of the circulation of the virus in West Africa, as there are continued outbreaks in Nigeria and recently (December 2007) in Benin. In September 2007, MOFA lifted the quarantine measures and restrictions on movement of live poultry products in and out of the Tema and Sunyani Municipalities and the Ketu District. This has allowed restocking to take place. A revised Action Plan for Avian and Human Pandemic Influenza 2007-2008 has been prepared to guide all activities. This Plan has incorporated all the lessons learned during the outbreaks.

HPAI situation in neighbouring countries

As introduced in section 2, among the countries bordering Ghana are Cote d'Ivoire, Burkina Faso and Togo. Cote d'Ivoire had an outbreak in the Abidjan area that was confirmed on May5, 2006. Ghana placed a ban on the importation of all live poultry, poultry products and by products from countries reporting outbreaks of HPAI H5N1. Burkina Faso had an outbreak in April 2006 in Houet, Kadiogo and Sanguie. The outbreaks in Togo were in Siegbehoue and Agbata (Lacs, Region Maritime), and Tonoukout (Zio, Region Maritime) in June 2007. With the outbreak in Benin in December 2007, there was a continuum of affected countries along the West African coast from Cote d'Ivoire to Cameroon. In total, 8 countries in West Africa have recorded HPAI: Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Ghana, Nigeria, Niger and Togo. All of these countries are of the Economic Community of

West African States (ECOWAS); hence, there is constant movement of people and goods between them, thereby posing a danger for circulation of the virus between these countries.

On July 24, 2008, the Director of Nigeria's Federal Ministry of Agriculture and Rural Development reported HPAI outbreaks in Kebbi (involving a local chicken sampled during routine surveillance of live bird markets) and on July 19, 2008 in Gombe (a single duck sampled during routine surveillance exercise at live bird markets). Samples were confirmed positive by HI, RT-PCR and virus isolation tests.

An FAO ECTAD HPAI Situation report on 25, July 2008, quoting a field officer in Nigeria, stated that "After nearly 10 months without an outbreak, new HPAI outbreaks have been confirmed in Fagen-Kawo village, Dawakin Tofa LGA, Kano State, and Kagarko quarters, GRA, Katsina State on 24 July. A total of 4,253 birds were involved at Kano and 85 in Katsina. As usual immediate action has already been taken to control the outbreak. The affected farms are being depopulated and disinfected. In addition, detailed epidemiological investigation is ongoing to trace the source of the outbreak. Earlier, during one of our regular surveillance and disease search in the poultry production system and marketing chains across the country, positive cases were discovered in Pantami livebird Market in Gombe and Central Market in Birin Kebbi, giving the indication that there is a possible reintroduction of the disease in the country."

These latest developments emphasize the risk of transmission of the virus for recurrence in the sub-region.

Economic impacts of HPAI

In Ghana the number of poultry culled due to the three outbreaks was 40,727 birds with estimated replacement cost of layers being US$212,340 as of June 2007 (VSD 2008). The total compensation paid for these 40,727 culled birds was US$166,840 (VSD, 2008). The total value of culled poultry is not available, and it may not be prudent to use the average prevailing prices because of variations in age and types of birds culled. The total cost of HPAI prevention, control and containment was estimated at US$4,297,790 (VSD, 2008). The breakdown of this figure is given in the table below.

Table 7.2 Costs of control measures against HPAI H5N1 in Ghana, 2006-2007

Cost Item	US$
Prevention and control expenses from both Government of Ghana and donors as at September 2006	2,000,000
Payment of compensation to farmers for culled birds	166,840
Biosecurity training workshops from FAO	50,000
Technical expert missions and containment activities from FAO	45,000
Vaccine for HPAI from OIE	80,000
AfDB	300,000
USAID	50,000
VSD staff time spent, prevention, control and stamping out HPAI	1,564,240
Support from USAID for active surveillance in 2006	41,710
Grand Total	4,297,790

Source: VSD (2008).

In addition to these, the estimated cost of biosecurity and hygiene on sector 3 and 4 poultry farms was US$1.1 million (VSD, 2008). No costs were incurred for vaccines since, as explained above, there is a policy of no vaccination against HPAI H5N1 in Ghana (VSD, 2008). VSD is not convinced that there is enough available evidence on the benefits of vaccination to override the risks involved.

There is no published information available either on the changes in the numbers of farms before and after the outbreak or on the number of businesses going bankrupt and loss in employment. However, anecdotal information indicated that some farmers folded up their businesses due to their inability to market products as a result of the ban on poultry and the sale of poultry products during and sometime after the outbreak. For example, according to the Poultry Farmers' Association, there have been several job losses and bankruptcy due to the HPAI outbreaks and threats. In 2005 the Association had 62 active members and 18,000 broilers, whereas today they have 3 members with 3,000 broilers. Similarly, in 2005 they had 47 members producing eggs and today they have 33 members producing eggs. Overall, in Ghana there were 1,500 egg producers in 2005 and today there are only 500. These figures provide some indicators of the economic losses suffered by poultry farmers.

There is no quantitative information on reductions in domestic consumption of poultry products during the outbreaks. However, according to a MOFA statement during the outbreaks of 2006 in the neighboring West African countries, "the scare of the bird flu alone led to a drastic reduction in the demand for poultry and poultry products." VSD (2008) stated that the demand for and consumption of poultry and products went down during the outbreak because of the fear of contracting HPAI from eating these products.

There is no information on the impact of HPAI outbreaks on the other industries, such as catering and tourism. There is also no quantitative information on the impact of HPAI on other industries in the poultry chain. However, MOFA stated that as a result of the reductions in demand due to the outbreaks in 2006 in neighboring countries, "poultry farmers could not dispose of their poultry and poultry products resulting in additional expenditure on feeding and maintaining the matured poultry with no prospect of finding markets for the birds. Furthermore, poultry farmers who could find some form of markets had to sell at ridiculously low prices. For example, a crate of thirty eggs which hitherto was ¢30,000 came as low as ¢11,000 during the scare."

Information on the losses in poultry export revenues is also currently not available. Ghana mainly imports meat, eggs and frozen processed food items that contains poultry. However, some farms export day old chicks to West African countries and were affected by the ban on export on poultry and poultry products following the first outbreak in Tema in May 2007. For example, Afariwaa farms, which had relocated from the Tema area to another location outside the outbreak area many years before the outbreak, had to assure customers from Sierra Leone and Benin that they were not affected (Marbett, 2007a).

In general, more work has to be done and more data should be generated on the economic impact of HPAI in Ghana. At the moment, most of the information available is secondary data whose reliability and accuracy might not be assured. Also, there are gaps in the data which will need to be filled.

The key ministries and public institutions responsible for poultry sector and HPAI management

The key ministries and public institutions responsible for poultry sector and HPAI management include:

- MOFA, specifically the VSD, which has the mandate to maintain and improve animal health, increase the production and productivity of farm animals and protect human health;
- The Ministry of Trade and Industry which oversees trade;
- The National Poultry Development Board responsible for the development of the poultry industry in Ghana; and
- The AIWG created in October 2005 and charged with coordinating Ghana's plans and actions to address the threat of AI pandemic, as explained above.

Current policies, laws and legal framework related to poultry sector and HPAI.

The Diseases of Animal Act 83 of 1961, which covers the prevention and control of the spread of infectious and contagious diseases among animals and birds, provides the legal framework for the poultry sector and the control of HPAI. Recently, the MOFA, in an effort to promote bio-security on farms, has instituted a policy linking future payment of compensation for loss of animals from diseases to the level of biosecurity on farms. The exact modalities and guidelines of this policy are yet to be worked out.

The importation of animals is governed by the Animals (Control of importation) Ordinance 1952 number 36. Animal rearing in settled areas is also governed by various local council/authority bylaws. These may directly or indirectly contribute to the control of animal diseases.

Food safety, food production and food standardization are governed by relevant laws and regulatory systems under the Food and Drugs Board Act and Ghana Standards Board Act and related laws.

Country-level organizational structure for HPAI management.

HPAI management in Ghana is done through the AIWG. As already mentioned, the AIWG was created in October 2005 and expanded after the outbreak in 2007 and charged with coordinating Ghana's plans and actions to address the threat of HPAI pandemic. The group has been expanded to include representatives from the following various national and international public and private institutions. These institutions and their roles are listed below:

- Veterinary Services Directorate (VSD)/Ministry of Food and Agriculture (MOFA): Command and in charge of prevention and control of HPAI in poultry and poultry products and diagnostic tests.
- Ghana Health Services (GHS)/Ministry of Health (MOH): Responsible for human influenza prevention and control.
- Wildlife Division/Ministry of Lands Forestry and Mines: In charge of surveillance of HPAI in migratory and non-migratory wildlife birds.
- Noguchi Memorial Institute for Medical Research of the University of Ghana: Responsible for diagnostic tests in humans and confirmation of tests in birds.
- National Disaster Management Organization (NADMO)/Ministry of Interior: Responsible for the mobilisation of operational logistics.
- World Health Organization (WHO): Advisory role.
- Food and Agriculture Organization (FAO): Advisory role also provides technical assistance and funds.

- United States Agency for International Development (USAID): Advisory role also provides technical assistance and funds. Quality Health Partners/ Engender Health (an NGO): Advisory role.
- Ghana Red Cross Society: Advisory role Ghana Sustainable Change Project: Advisory role.
- United Nations Children's Fund (UNICEF): Advisory role and also responsible for risk communication.
- United Nations Development Programme (UNDP): Advisory role and provides funds.
- School of Public Health, University of Ghana: Provides technical support.
- John Snow International: Advisory role.

It is not possible to rank these institutions according to their level of influence on HPAI management. However, VSD appears to have a commanding and major role.

An analysis of the key organizational structures and response systems as part of the development of a HPAI preparedness plan was reported by USAID/ Quality Health Partners in November 2006. The following is an extract from the report:

- *Veterinary Services Directorate*

The Veterinary Services Directorate (VSD) is present in all the 138 districts of Ghana. These districts send regular activity reports through the 10 regional offices to the headquarters in Accra. The VSD has had extensive experience in dealing with animal diseases and is backed by legislation relating to animal disease control. The relevant laws are the Diseases of Animal Act of 1961, Act 83, and the Veterinary Surgeons Law 1992 (P.N.D.C. L.305C).

The VSD Accra laboratory is the centre for the Pan African Programme for the Control of Epizootics diseases. It is engaged in the production, testing and monitoring of a vaccine against Newcastle disease. The VSD has routinely managed outbreaks of Foot and Mouth, Newcastle and Rinderpest diseases. It has successfully controlled African swine fever since it first occurred in 1999 in Ghana.

- *Integrated Disease Surveillance and Response System*

Ghana, in 1998, adopted the WHO/AFRO Integrated Disease Surveillance and Response (IDSR) strategy. Under a 5-year comprehensive plan (2001-2005), the GHS/MOH Disease Surveillance Department strengthened the disease surveillance and response arm of the health delivery system in close cooperation with development partners, namely WHO, CDC, and USAID. The IDSR model in Ghana provides clear protocols for the investigation of all suspected disease outbreaks. In November 2005, the Ghanaian IDSR system could recognize 23 priority diseases excluding influenza. These diseases are identified through a network of community based surveillance volunteers whilst others are seen at fixed health facilities and identified using standard case diagnoses tools. There are indications that in Ghana, the sensitivity of the IDSR for diseases such as acute flaccid paralysis, yellow fever and meningitis is approaching 100%.

With regards to epidemic/emergency preparedness and response, the GHS/MOH has a budget line for supporting such crisis. Investigation and management of epidemics are conducted through regional/district epidemic management committees. A recent example is

the 2002/2003 planning by national and regional epidemic management committees for the risk posed by severe acute respiratory syndrome (SARS). For SARS planning, isolation centres in a few health facilities were identified and contingency measures were implemented.

- *Health Promotion Unit*

The Health Promotion Unit (HPU) is a technical wing of the Public Health Division of the Ghana Health Service. It was established as a collaborative effort between the GOG and the WHO. In June 2005, a national health promotion policy was adopted by the MOH/GHS with the goal of providing accurate and relevant health information to Ghanaians. The HPU coordinates the health promotion components of various GHS programmes including acquired human immunodeficiency syndrome (HIV), adolescent reproductive health, safe motherhood, family planning and malaria control. The HPU, in collaboration with the development partners, has implemented various interventions for promoting adoption of healthy behaviours by individuals, families and communities. There is an appreciable increase in awareness and knowledge on HIV infection, immunization, family planning, nutrition and reproductive health. Various target specific educational materials on health have been produced and distributed for use in the Ghanaian population.

- *National Disaster Management Organization*

The National Disaster Management Organization (NADMO) is the recognized governmental agency charged with the multi-sectoral management of responses to all disasters (including human health). This organization is made up of representatives from MLG&RD, various MDAs including GHS/MOH, MOFA, MLFM, MOI, Security Agencies (Police, Military), Trade, Aviation/Transportation and Finance. The NADMO played a significant role in the national and regional planning in the preparation for a potential SARS outbreak in 2003.

- *Noguchi Memorial Institute for Medical Research*

The Noguchi Memorial Institute for Medical Research (NMIMR) is a semi-autonomous Institute in the College of Health Sciences, University of Ghana. The mandate of the Institute is to conduct research into diseases of public health importance. It works closely with the MOH in several health programmes to prevent and manage diseases such as malaria. The NMIMR is also the national reference laboratory for poliomyelitis and assists with the expanded programme on immunization. It is classified as a Pathogen Level 3 facility and investigates infectious diseases such as Tuberculosis and HIV. There is also routine performance of virus culture, molecular detection of viral nucleic acids and serological assays for detection of viral antibodies.

- *Wildlife Division*

Ghana and other countries in West Africa are situated in the flight path of migratory birds from Asia and Europe. The Wildlife Division (WD) of the Forestry Commission, Ministry of Lands, Forestry and Mines, is responsible for monitoring migratory birds in the coastal wetlands and other landing sites to determine the timing, number, and condition of these migratory birds. There are seven major sites of international importance as resting and feeding grounds for large concentrations of several species of migratory and resident water

birds. WD records show that the waterfowl bird species, documented as a natural reservoir of avian influenza, usually visit the Ghanaian wetlands in the month of April.

In brief, the VSD/MOFA is charged with the monitoring of the occurrence of important animal diseases, DSD/GHS/MOH with human diseases, and WD/MLFM with wildlife and migrant birds in Ghana. These detection systems and accompanying responses function at a reasonable level of success. The assessment however revealed that none of these monitoring structures – animal, human and wildlife, have adequate capability to report or respond to specific cases of Avian Influenza. Ghana therefore needed to mobilise these systems quickly and decisively to limit the potential severe impact (economic, social, health) that an AI pandemic would have in Ghana's resource constrained setting."

Major institutional service deliveries

Veterinary Personnel

The major institution for veterinary service delivery is the VSD. The private sector plays only a small role in animal health care delivery in Ghana. Research and extension is done by the universities and the Council for Scientific and Industrial Research (CSIR) - Animal Research Institute, sometimes in collaboration with VSD. The animal health care delivery system in Ghana is well organized from the district through the regional to the national level with a clear disease reporting system at all three levels. The animal health care delivery in each region is headed by a veterinarian, while service delivery at the district level is headed either by a veterinarian or by a veterinary technical officer. The staff strength of the VSD in 2007 was 225 professional and semi-professional staff and 490 technicians (i.e., technical officers and above). There are less than 20 private veterinarians in private practices, mainly in the large cities of Accra and Kumasi. These private veterinarians, however, are not directly involved in HPAI surveillance and control measures. Similarly, there are a number of veterinarians at the various quasi-state agencies, including universities, research institutions and the army, who also are not directly involved in HPAI surveillance and control. The major actor in HPAI surveillance and control is the VSD, whose mandate is to maintain and improve animal health, increase the production and productivity of farm animals and to protect human health, as stated above.

The numbers of veterinarians per administrative district are reported in Table 7.3.

Table 7.3 Numbers of veterinarians per district

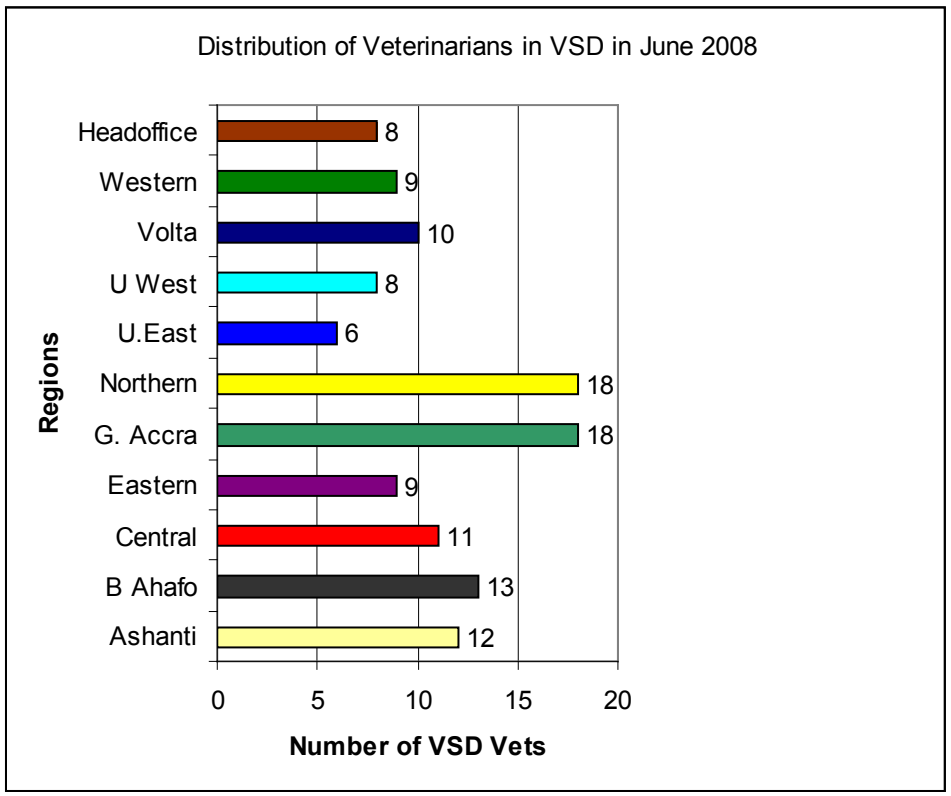
NN	Name of District	Number of Veterinarians
1	Kwabre	1
2	Kumasi Metro Assembly	6
3	Sekyere West	1
4	Dormaa Ahenhro	1
5	Techiman	2
6	Agona Swedru	1
7	New Juaben	2
8	Yilo Krobo	2
9	Veterinary Headquarters	9
10	Accra Metro Assembly	9
11	Accra Veterinary Laboratory	5
12	Ho Veterinary laboratory	1
13	Kumasi veterinary laboratory	2
14	Savelugu/Nanton	4
15	Pong Tamale laboratory	2
16	Tolon/Kumbungu	2
17	Wa	1
18	Nadowli	2
19	Ho	3
20	Denu/Ketu	2
21	Wassa West/Tarkwa	1
22	AhantaEast/Shama	4
23	Sekyere Dumasi	1
24	Atebubu	1
25	Wenchi	1
26	Kintampo	1
27	Komenda/Edna/eguafo/Abirem	1
28	Abura/Aseibu-Kwamankese	1
29	Awutu/Efutu/Senya/Winneba	1
30	Afram Plain/kwahu North	1
31	East Akim/kibi	1
32	Dangme West	1
32	Tema Metro assembly	2
33	Adaklu-Anyigbe	1
34	Dangme East	1
35	Bolgatanga	2
36	Jirapa/Lambussie	3
37	South Tongu/Sogakope	1
38	Asante Akim North /konongo	1
39	Juaben/Ejisu	1
40	Jaman /Brobo	1
41	Breman Asikuma	1
42	Kwahu South /Nkawkaw	1
43	Asuogyaman/Akosombo	1
44	Tamale Metro Assembly	2
45	East Gonga	2
46	Zabzugu/Tatali	1
47	West Mamprusi	1
48	Gushiegu/Karaga	1

NN	Name of District	Number of Veterinarians
49	Bawku East	1
50	Bawku West	1
51	Kassena/Nankana	1
52	Bongo	1
53	Sissala	1
54	Lawra	1
55	Nkwanta	1
56	North Tongu	1
57	Bibiani/Anhwaso/Bekwai	1
58	Amansia/East/Bewkai	1
59	Assin Foso	1
60	East Mamprisi	1
61	Brekum	1
62	Sunyani Metro assembly	2

Source: VSD (2008)

The distribution of VSD veterinarians across regions in June 2008 is presented in Figure 7.4.

Figure 7.4 Regional distributions of VSD veterinarians in Ghana in June 2008



Source: Turkson (2008, unpublished data)

However, the use of the regional distribution on basis of number of veterinarians is deceptive because this metric does not take into account those veterinarians who are not in the field by virtue of holding an administrative position or working in the laboratory. This presents a problem as to the actual numbers directly involved in providing clinical services in the field.

Laboratories

There is only one HPAI detection laboratory (Accra Veterinary Investigation Laboratory, which is also known as National Veterinary Laboratory, Accra, P2 level) in Ghana at the moment. Three of the staff in the Accra Laboratory have been trained extensively abroad in the detection of HPAI, and 12 staff in the laboratories in Accra, Ho, Takoradi, Kumasi and Pong Tamale have been trained locally. All field staff (veterinarians and some technical officers) have been trained to conduct the field tests (Rapid Antigen). There are ongoing efforts to enhance the capacities for detection of HPAI at the Kumasi and Pong Tamale Veterinary Investigation Laboratories to cover the middle and northern parts of the country, respectively.

A USAID/CDC/NAMRU-3 report, which was written after the outbreaks of 2007, stated the strengths and weaknesses of the laboratories and made some recommendations. The following subsections are summarized from that report.

Laboratory Strengths

The main strengths of the veterinary investigation laboratories in Ghana are the following:

- Central Veterinary Laboratory can carry out rapid screening of HPAI using rapid antigen test kits.
- NMIMR can carry out rapid testing of human, as well as animal, samples with by RT-PCR. NMIMR has separated, confined areas to prevent cross contamination. All samples to date have been analyzed and results have been reported within 24 hours.
- NMIMR has a NAMRU-3 laboratory expert on site to assist in technical difficulties with diagnostic tests.
- RT-PCR is a highly sensitive and specific diagnostic test.
- NMIMR and the National Veterinary Services Laboratory are both located in Accra, making transport of samples easy.

Laboratory Weaknesses

The main weaknesses of the veterinary investigation laboratories in Ghana are identified to be the following:

- HPAI H5N1 virus was isolated under BSL-2 conditions at the Government Veterinary Services (GVS) lab, when it should only be grown under BSL-3 enhanced conditions. This misconduct put laboratory workers at significant risk.
- Lack of veterinary sampling materials; less than ideal transportation equipment and conditions; and lack of standard operating procedures for sample collection/transportation (e.g., lack of procedures on who should collect samples, methods of labelling and standardized data collection forms).
- All samples must be sent to the national GVS laboratory. There are no district or regional level laboratories for testing. This causes problems, especially for the rapid transportation of samples from those districts and regions located. There are also no rapid antigen test kits available at regional levels.
- There is currently no mechanism in place for rapidly transporting samples to NMIMR.
- There is an evident lack of appropriate cold chain procedures.
- Various equipment, such as shipping containers and dry ice, are not available in quantities sufficient enough to respond to an outbreak with multiple potential cases.
- There is no central point of contact nor a repository of data.
- Labelling of samples was poorly done, which resulted in a need for retesting, thereby delaying the reporting of positive cases. In addition no epidemiological information on the birds was sent along with the samples to NMIMR.

Recommendations

The report made the following recommendations to improve the laboratory capacity in Ghana:

- Review the HPAI laboratory diagnostic capacity of the Veterinary Laboratories of Accra and provide infrastructure to allow them to perform under good laboratory practice conditions.
- Identify a method of maintaining a cold chain for shipping both human and bird samples to national laboratories.
- Develop standard operating procedures for human and bird sample collection and transportation. Information should be included on the method of collection, person responsible for collecting the sample; method of labelling the sample, sample storage,

packing for transportation and methods of transportation. Standardized data collection forms and sample submission forms should be included.
- Provide regions with bird and human sampling materials including swabs and viral transportation equipment.
- Enhance regional laboratories to enable them to perform the minimal first steps of HPAI diagnostics. This would prevent the national laboratory from being overwhelmed when several outbreaks were suspected or if large active surveillance campaigns were to be carried out.
- Provide avian rapid antigen test kits to each region as part of the national preparedness and response plan.
- Training of laboratory personnel to refresh them on performing diagnostic techniques. This was put as an urgent request by the Ashanti veterinary investigation laboratory.
- National coordinator of HPAI information should be identified. The responsibilities of the coordinator should include the overseeing of the data collection and storage, and assistance in the dissemination of the information to all appropriate parties

Decentralization and responsibilities

Ghana went through a local government decentralization exercise in the 1980s where governance was decentralized to the District Assembly level. During the same time, MOFA also started a 'Unified Extension' policy. These changes affected the effective delivery of animal health services. Moreover, most recently VSD is being re-organized to link the national directorate directly with the field staff.

Risk communication

In the event of a disease outbreak in an area, the veterinary technical officer or extension agent informs the District Veterinary Officer who in turn informs the Regional Veterinary Officer and the National Director of Veterinary Services. The MOFA is informed for the relevant sections of the Animal Diseases Act to be invoked.

For HPAI surveillance and control, a communication sub-committee of the AIWG works closely with the VSD. This sub-committee is made up of specialists from the Wildlife Division, MOFA, Ministry of Health/Ghana Health Services, WHO and UNICEF. UNICEF played a role in communicating HPAI risk before and after the outbreak, their communication efforts however, have mainly focused on the issue of bird to human transmission.

According to Woodfill and Gaturuku (2007), since the HPAI outbreaks in Nigeria in March 2006, the AIWG communication sub-committee has been implementing a campaign to counteract the fear about pandemic influenza and to promote consumption of poultry and poultry products. Posters, flyers and other materials which convey information on the handling of dead birds, and the notification of appropriate authorities were developed and distributed (See Appendix 7)

The VSD has established communication networks in all ten regions of Ghana for the reporting of HPAI. There are hotline numbers in three regions (Ashanti, Greater Accra and Northern) which can be called at all times from anywhere in the country to report suspected cases of dead, dying or sick birds.

A large amount of information on the threats and symptoms of HPAI was conveyed to the public through the media, workshops, leaflets, pamphlets, car stickers, skits and sketches to the public. These communication campaigns are especially heightened before, during and immediately after the

outbreaks in Ghana and any time there is an outbreak in the West African region. Examples of some of the pamphlets/leaflets produced and distributed nationwide are presented in Appendix 3.

Recently, MOFA produced a CD video on Bird flu/Avian Influenza Disease to educate farmers and the general public, with funding from UNDP. Similar campaigns were carried out during the outbreak of African Swine Fever in Ghana in 1999-2000, and these were proved to be effective. The experiences and lessons learnt from the ASF information communication campaign proved helpful during the HPAI outbreaks in 2007.

Through these information campaigns, the public was made aware of how and where to report the occurrence of HPAI. Telephone numbers for all the regional contacts and hotline mobile numbers for the outbreak areas were made available to facilitate the reporting of suspected cases (see example in the flyers in Appendix 7). Also, members of the public were informed as to where to physically report suspected cases in the various regions.

The current state of action and reporting mechanisms is that of high alert. When HPAI is detected, all the plans and actions outlined and used in previous HPAI outbreaks are set into motion. An Emergency Preparedness team from the VSD is on standby at all times, ready to react once HPAI is detected. The government places a high level of importance on combating the disease as early as possible. An example of this is given in an article in the May/June 2007 edition of African Farmer entitled “Rapid action from Ghana to H5N1” by Terry Mabbett. Mabbett noted that “the refreshingly open and sharp response by Ghana boded well for quick stamping out of the virus to keep one of Africa’s most sophisticated poultry industries H5N1 free.” According to Mabbett, the fact that the swift action by the government stopped the disease in its tracks and the absence of further outbreaks after the initial three outbreaks are a testimony to this.

Compensation Plan

The government set up a compensation plan for reporting HPAI and used the scheme below as a guideline for payments. This guideline was printed on a flyer and widely distributed. The scheme was worked out and agreed upon with the active participation of the National Poultry Development Board and other stakeholders. The cost estimates used by the Ghana National Association of Poultry Farmers in a proposal for poultry compensation is presented in Appendix 6. The scheme used and circulated in a flyer is depicted below in Table 7.4.

The government paid a mondetary compensation to all affected farmers whose birds were culled during the three outbreaks in 2007. The compensation was based on a percentage of the prevailing price in 2007 as shown Table 7.4. Payment was for culled birds only, i.e., not for reporting the disease or for dead birds. On those farms that were infected by the HPAI virus, compensation payments were also given for feed, feed ingredients and veterinary drugs in stock. The payments, in the form of checks, were given about two to two and a half months after the actual outbreak of the disease on the farms. The cost of birds that died from disease, for which compensation was not paid, was estimated at US$130,000 (VSD, 2008).

The government has a new policy that future compensation payments will be linked to the level of biosecurity (or the absence of it) on the farm. This is yet to be incorporated into the compensation scheme.

Table 7.4 Compensation scheme for destruction of poultry and poultry products in HPAI outbreaks in Ghana in April-June 2007

Class of birds	Market Price GH cedis	Percentage Payment	Amount payment GH cedis
Parents			
Broiler	12	90%	10. 8
Layer	9	90%	8.1
Commercial			
Layer	5	85%	4.3
Broiler	5.5	80%	4.4
Turkey	50	80%	40.0
Duck	3	70%	2.1
Cockerels	3	70%	2.1
Table eggs	0.1 per egg	50%	0.05
Fertile eggs	0.3 per egg	60%	0.18
Day-old chicks(Broiler)	0.7	90%	0.65
Day-old chicks(Layer)	1.1	90%	1.0
Guinea fowl	3	70%	2.1

Source: Avian Influenza Working Group flyer (2007)
1US$=0.95 GH cedis as at July 2007

8. Risk Factors and Risk Assessment

According to the Directorate of Veterinary Services and the Animal Health Officer, Africa Regional Office for FAO, no quantitative or qualitative risk assessments nor risk analyses of HPAI was carried out in Ghana. This represents a critical knowledge gap.

Potential different pathways of introduction

The wild migratory birds flyways relevant to Ghana are the East Atlantic and Mediterranean flyways. The coastal wetlands are the staging posts for wild migratory birds in Ghana. The Ghana Wildlife Society list these wetlands as the Muni-Pomadze Ramsar site, Densu delta, Sakumono Ramsar site, Songor Ramsar site, Keta Lagoon Ramsar site and Amanzuri wetlands/Esiama beach. Other staging posts include Mole National Park, Bui National Park, Digya National Park, and the Gbele Resource reserve. According to the Ghana Wildlife Society, the migratory birds arrive in Ghana in August and leave by March/April. The species include waders, terns, gulls, ibis, pelicans, cormorants, bitterns, herons, egrets, ducks, swans and geese. The migratory wild birds that are highly susceptible to HPAI include ducks, geese, swans, gulls, waders, and terns (Dr. Suu-Ire, a wildlife epidemiologist with the Wildlife Department, Accra, personal communication 2007). In early 2007, samples from 136 birds from the Intra-African and Intercontinental migratory groups from 3 sites in Ghana (Keta Lagoon, Densu Delta/Muni-Pomadze and Tono Irrigation Dam) tested negative for HPAI as well as for Low Pathogenic AI. There is, however, no detailed data or information available on the route of the migratory wild birds and their contact with local water wild birds/domestic fowls within Ghana.

There is also no documentation on the virus activity or prevalence of HPAI among wild non-migratory bird species in Ghana. The local birds that are affected are vultures and hawks. There is also no information on the prevalence of H5N1 in local water wild birds (Dr. Suu-Ire, a wildlife epidemiologist with the Wildlife Department, Accra, personal communication, 2007).

The role of wild migratory and non-migratory birds in the transmission of HPAI in West Africa is ambiguous. It is suspected that trade may have a major role in the transmission of the disease rather than wild birds.

Imports

Legal Imports

The ports of entry for legal importation of poultry and poultry products include Tema (sea), Accra (air), Aflao (land), Elubo (land), Dormaa-Ahenkro (land), Mognori (land), Pusiga (land), Hamale (land), Paga (land), Kulungugu (land) and Kapulima (land).

In 2007, 63,276 tonnes of chicken and 3,514 tonnes of turkey were imported through Tema harbour. There is no reliable information available for the other ports of entry.

Illegal and informal imports

There are defined border crossings and controls between Ghana and all neighboring countries. However, the border is porous and made up of same ethnic groups on each side of the border which make control ineffective. All unapproved border crossings are potential points of entry for poultry

and poultry products, and these are many and scattered all along the borders. The most likely types of illegal imports are eggs, frozen meat and live birds. In 2007, guinea fowls from Burkina Faso and Cote d'Ivoire were illegally imported into Ghana. Guinea fowls (totaling 2564) with a value of GH Cedis 10,256 were seized and destroyed (VSD, 2008). The motivations for illegal entry are varied for various products. Although figures for prices across the borders are unavailable, price differentials across borders may encourage smuggling of poultry and various poultry products, especially eggs.

Countries of origin of legal poultry and poultry products imports and distribution within Ghana

Day old chicks and hatching eggs imported in 2007 came from the European Union (EU) (93%) and the USA (7%) (VSD, 2008). Within the EU, the specific countries of origin of imports were Holland, Belgium, Czech Republic, France, Germany and the UK. In the same year, frozen chicken meat was imported from Argentina, Belgium, Brazil, Canada, Denmark, France, Germany, Holland, Norway, the UK and the USA. Turkey meat imports were from Brazil, Canada, Chile, France, Holland and Italy.

Legal poultry and poultry product imports were distributed countrywide over a wide network (please see Figure 4.1 above for the value chain). However, a major concern in the distribution of poultry products is the north-south trade from Accra through Kumasi to other areas, which constitutes a potential for the spread of HPAI. The Lagos-Abidjan Corridor of the West African Trade Routes encompassing the East-West Road Network, especially in southern Ghana, also has the potential of being instrumental in the spread of the disease. There is neither detailed data nor information on the animal/poultry markets in the country and routes of domestic poultry and poultry products in Ghana.

The common means of transportation of poultry and poultry products include carrying of cockerels and pullets on head for sale by itinerant sellers (by foot), bicycles/motor bikes, saloon cars/taxis, mini-vans, passenger vehicles (buses) with the birds (especially guinea fowls) in reed baskets loaded on top and boats/canoes on rivers or water bodies in certain communities.

The movement of poultry within Ghana requires movement permits. However, these are not normally obtained for birds moved for personal consumption or rearing purposes and, therefore, pose a danger for disease transmission.

According to a USAID/CDC/NAMRU-3 report, it is very difficult to control poultry movements in Dormaa-Ahenkro in the Brong Ahafo Region because families have farms on both sides of the border (in Ghana and in Côte d'Ivoire) and traders move easily between farms on either side of the border. This presents a disease transmission risk.

Marchot (undated) noted that human activities, especially illegal trade of live birds, were perceived to be the most likely modes of spread of the disease into and within countries and even beyond. Therefore, the risk of HPAI spreading across national borders with legal and illegal importation of live birds and products was a major concern. Notwithstanding, the threat of introduction and spread of HPAI virus by wild birds still needs monitoring.

9. Conclusions and Research Gaps

Much of the information reviewed in this paper emerged from discussions with officials of the Ministry of Food and Agriculture in general and Veterinary Services Directorate in particular, as well as members of the Ghana National Association of Poultry Farmers. Limited published material, grey literature, including Government and donour report, and projections based on the 1996 Livestock Census, as well as data from the Food and Agriculture Organisation (FAO) were also employed in the writing of this review. Since the last Livestock Census took place over a decade ago, there is a dearth of dependable statistics, as well as a general lack of rigorous scientific research results on the poultry industry in Ghana. It is of great importance to fill the identified research gaps through a comprehensive survey of the poultry resources, especially with regard to village poultry, which constitutes a major source of livelihood sustenance in rural Ghana.

In addition, the contribution of commercial poultry production to the Ghanaian economy also needs to be studied in greater detail, especially in relation to maize prices, local maize production and frozen chicken meat imports. Poultry products are imported mainly from Brazil, the European Union and the USA, and volumes increased by 1200% between 1995 and 2004. With a high domestic demand for poultry products and the government's reluctance to increase import tariffs to make domestic production more competitive, commercial producers had to reduce broiler production in favour of egg production in order to be able to stay in business. This has affected poultry feed production and hatchery operations and predictably employment in the commercial poultry sector. It is necessary to carry out studies to strategize for the strengthening of domestic commercial poultry production to enhance employment in this sector.

The outbreaks of Highly Pathogenic Avian Influenza (HPAI) in Ghana were effectively controlled as a result of prior preparation, in the form of public awareness creation, and institution of an effective Preparedness and Response Plan. The effective control of the outbreaks was also helped by the payment of compensation for culled birds. The comprehensive census of poultry populations, as suggested above, and the identification of live bird markets with geo-referred farm locations would contribute greatly to a risk analysis and risk assessment of the poultry sector. Epidemiological analyses are constrained by the absence of or unreliable nature of such data. The real or potential risks of HPAI in Ghana cannot be adequately and reliably assessed when the numbers of poultry involved, the locations, the types of production or farming systems, etc. are unknown. Furthermore, the absence of reliable data also has an impact on the quality of policy formulation in the poultry sector and has led to, for example, controversy over the contribution of the sector to the agricultural GDP among end users of statistical data on the poultry industry. In addition to data collection, analysis and risk assessment efforts, a serious education campaign for biosecurity on poultry farms, including village poultry keeping, should be undertaken. The government has taken a step in this direction by linking future compensation payments to farmers for HPAI culling to the standard of biosecurity on their farms.

Projections have been used. Another gap was in the area of HPAI H5N1 risk analysis and assessment in Ghana.

At the workshop the further gaps identified were:

In addition to these abovementioned, knowledge gaps, various other gaps were identified during the Pro-Poor HPAI Risk Reduction Strategies Project's Multi-stakeholders Workshop, which took place in Accra in June 2008. The socio-economic research gaps identified during the workshop include the following:

- 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 a 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; and
- Impacts of HPAI on the macro economy: Trade impacts, especially with neighboring 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.

In addition to the socio-economic knowledge gaps, several gaps pertaining to HPAI risk, disease spread and institutional response were identified. These included:

- 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 in how this may change if moved from a sporadic case, to an acute case, to an endemic situation;
- In the future will it be 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.

The undertakings of the Project will endeavour to fill as many of these research gaps as possible.

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Appendix 1: International Monetary Fund Statement on Ghana Government Reversal of 20% Import Duty on Poultry Imports (May 2003)

Ghana 2003 Article IV Consultation, and requests for a Three-Year Arrangement under the Poverty Reduction and Growth Facility and for Additional Interim Assistance Under the Enhanced Initiative for Heavily Indebted Poor Countries – Staff Report, Staff Supplement and Statement; Public Information Notice and Press Release on the Executive Director for Ghana.

Under Article IV of the IMF's Articles of Agreement, the IMF holds bilateral discussion with members usually every year. In the context of a combined discussion of the 2003 Article IV consultation with Ghana, and requests for a three-year arrangement under the Poverty Reduction and Growth Facility and for additional interim assistance under the enhanced Initiative and Heavily Indebted Poor Countries, the following documents have been released and are included in this package:

The staff report for the combined 2003 Article IV consultation, and requests for a three-year arrangement under the Poverty Reduction and Growth Facility and for additional interim assistance under the enhanced Initiative for Heavily Indebted Poor Countries, prepared by a staff team of the IMF, following discussions that ended on February 3, 2003, with the officials of Ghana on economic developments and policies. Based on information available at time of these discussions, the staff report was completed on April 2, 2003. The views expressed in the staff report are those of the staff team and do not necessarily reflect the views of the Executive Board of the IMF.

A staff supplement of April 24, 2003 and staff statement of May 9, 2003 updating information on recent economic developments.

A public Information Notice (PIN) and Press Release, summarizing the vies of the Executive Board as expressed during its May 9, 2003, discussion of the staff report on issues related to the Article IV consultation and the IMF arrangement, respectively.

A statement by the Executive Director for Ghana.

Ghana's medium-term plans for reform of its tariff regime are bound up with those of the Economic Community of West Africa States (ECOWAS), the members of which have yet to agree on a timetable for the next phase of tariff reforms.[1] In the meantime, the 2003 budget proposed several increased in external tariffs, to provide increased protection to certain industries. [2] The staff argued that such measures were likely to be damaging to the authorities' growth and poverty reduction strategy, as they would raise the consumer prices of two of Ghana's staple foods (rice and chicken), and damage long-run competitiveness in the affected sectors. The authorities have committed that these tariff increases will not be implemented during the period of the proposed arrangement (MEFP 40). The staff also discouraged the authorities from pursuing a so-called Domestic Content Bill, which would set targets for (if not actually require) companies operating in Ghana to source a minimum

[1] The only major change in Ghana's trade regime in the past two years has been the abolition in July 2002 of the special import tax.

[2] The main changes proposed were: an increase in duty on a range of imported finished products from 10 to 15 percent; an increase in the duty rate on rice imports from 20 to 25 percent; and a supplementary duty of 20 percent on poultry products.

proportion of their inputs domestically, rather than from abroad. [3] 3The staff argued that such a measure could impair the efficiency of local producers.

[3] The authorities recognize that requiring minimum domestic content could contravene Ghana's World Trade Organisation obligations.

Appendix 2: Lobby Document of the Ghana National Association of Poultry Farmers for Fair Trade Policy for the Poultry Industry.

COMPETITION FROM POULTRY MEAT IMPORTS

The Poultry Industry in its throes of decline can be traced to the early to mid 1990's, and the ad-hoc and inconsistent policies emanating from government. Duties were imposed, removed, and then re-imposed on imported raw materials. Preferential lending rates to agriculture or any policy that was deemed to subsidize agriculture was revoked. Though its effects were not peculiar to the poultry industry, the rapid depreciation of our local currency also contributed to the general decline.

Poultry farmers also use inputs and services that attract Value Added Tax (VAT) with no recourse to refund. These charges are punitive to the agricultural sector as a whole. The net effect has been that today, the poultry industry is beset with high costs of production. Unfortunately, produce price rises have not been commensurate with rises in production costs and this has led to severe erosion of margins, in some cases to the negative. Low produce prices have resulted principally from external forces notably unfair competition due to the importation of heavily subsidized poultry products.

Currently, the Ghanaian poultry industry is at its lowest ebb due to inherent and external factors. The major inherent factor is the resultant high cost of production and the major external factor identified is the unfair competition form highly subsidized imported frozen chicken, causing sale prices below costs of production to the local producer.

Therefore the previously seasonal problem of broiler sales with no market when they are ready at 7 weeks is now almost year-round. Many, so called experts, are quick to simplify the problem as one of ineffective marketing. This implies that local poultry farmers fail to market out products. From all the available data Ghana has an average per capita consumption of eggs and chicken meat way below that of the average for Africa. The country's consumption rates keep going up, an indication that the potential market for poultry is tremendous. The annually rising imports of subsidized dressed hens (approx. 42,500,000 in 2005) and attests to this market potential. However, these huge rises in volumes sold have been achieved without any marketing promotion. A pricing problem rather than a marketing problem, poultry farmers cannot then be adjudged as failing marketers in the prevailing circumstances.

In this era, (the new millennium) as a result of economic restructuring, many supports for agriculture have been removed. For the poultry industry, subsidies on drugs have been removed; duties have been imposed on feed raw materials and government no longer actively supports mobilization of credit towards agriculture though 20% of all lending by banks are directed to the agriculture sector. The Banks, with some justification are reluctant to support agricultural ventures, including poultry production. The high risks are all too apparent with the outbreak of Bird Flu. To reverse this trend in the industry,

(a) A lower than commercial finance cost.

(b) The removal of duties on our raw materials and

(c) The government should not to allow cheap imported products from subsidized markets to be dumped on out market.

The Negative effect of using cheaper imports as a tool to promote efficiency in the industry, being applied as a short term benefit will lead to the total collapse of the local broiler industry despite the increasing demand for broiler meat. The hatcheries depend on the local broiler industry as its hub for survival. Hatchery operations depend on the regular DEMAND FOR BROILER DAY OLD CHICKS.

The cycle of a broiler operation is 10 weeks by which time a crop had been reared and sold and preparations made to bring in another crop, thus keeping the hatcheries in full scale operation to satisfy demand. Unlike in a layer operation where a farmer orders replacement stock 15 to 20 months after his previous purchase of layer day old chicks. Thus, demand for layer day-old-chicks become low and far between especially now that most farmers have shifted into solely layer operations for egg production. Per unit cost of a day-old-chick increases for both layer and broiler day-old-chicks due to the high operational cost of the hatchery which is forced by the circumstance to operate far below its installed capacity and has no means of reducing most of its essential overheads such as electricity bills, cost of fumigants etc. Thus there is a need for government to set priorities and goals and make use, where possible, of local industries to reach those goals. One priority could be to improve the protein status of the populace by the year 2020.

Appendix 3: Estimated Cost of Farm Disinfection per month during Bird Flu Crisis – The case of Sydals Limited.

Potential eggs per hen housed	=	250
Selling price of an egg	=	GH¢1.20
Potential income per hen housed (13 months)	=	**GH¢30.00**
Cost of feeding layer to term	=	GH¢18.04
Medication (4% of feed cost)	=	GH¢0.72
Cost of grower at point of lay	=	GH¢4.28
Total Material Expenditure	=	**GH¢23.04**
Revenue per bird for 13 months	=	GH¢6.96
Revenue per bird for17 months	=	GH¢9.18
Revenue per bird per month	=	**GH¢0.54**
Cost of disinfectants, nose covers and hand gloves	=	GH¢1,230.40 per month
Number of birds on Farm	=	95,000
Unit cost of Farm Disinfection per Bird per month	=	**GH¢0.02**
The cost of Disinfection per bird to point of lay	=	**GH¢0.10**
The cost of providing Dedicated Clothing to Staff Per bird for 17 months	=	**GH¢0.03**
Therefore the total cost of Disinfection and Dedicated clothing per bird	=	**GH¢0.13**

The above illustrations show that not spending an extra GH¢0.13 per bird in stepping up biosecurity on your farm may predispose your farm to the danger of loosing your potential revenue of GH¢6.96 per layer per life cycle.

Government compensation per live hen – **GH¢4.30** meant for restocking of farm.

The Farm would not provide revenue for at least the next 10 months leading to a loss of potential revenue of **GH¢5.40** per month.

Note: GH¢1 = ¢10,000

Appendix 4: Biosecurity Manual

MINISTRY OF FOOD AND AGRICULTURE
VETERINARY SERVICES DIRECTORATE

In case of reply, the number and date of the letter should be quoted.
Telephone:00-233-(0)-21-775777
Tel.-Fax: 00-233-(0)-21-776021
E-mail:
vsdghana@gmail.com/vsdghana@hotmail.com

My Ref. No: D 57 V. 1V

Your Ref. No:.....

REPUBLIC OF GHANA

Ministry of Food and Agriculture,
Ministry Branch Post Office,
P.O. Box M. 161, Accra, Ghana.

20 - 3 - 2008

BIOSECURITY MANUALS

The Veterinary Services Directorate has compiled a Manual on Biosecurity for field use in educating Poultry Farmers and other Stakeholders in the Poultry Sector on hygiene and other interventions to minimize introduction of disease onto their farms and prevent disease spread from one farm to another.

Please find attached a copy of the Biosecurity Manual for your information and retention.

AG.DIRECTOR OF VETERINARY SERVICES
(DR. E.B. M. KONEY)

THE HON. MINISTER, MOFA

THE HON. DEPUTY MINISTERS, MOFA/VSD

THE CHIEF DIRECTOR, MOFA.

ALL REGIONAL DIRECTORS OF AGRICULTURE, MOFA

ALL REGIONAL VETERINARY OFFICERS, MOFA

BIOSECURITY MANUAL

Prepared By

VETERINARY SERVICES DIRECTORATE OF MOFA

FOR TRAINING OF FIELD STAFF, POULTRY FARMERS AND OTHR STAKEHOLDERS

March 2008

BIOSECURITY

INTRODUCTION

The poultry industry over the last few decades has been very successful with ever increasing supply of poultry products at reasonable cost. There has also been vertical integration of the industry ranging from feed suppliers to retailers in poultry products. However, the very success has also led to the continuing threat of diseases. There are a number of poultry diseases that can be controlled by the use of vaccines and drugs. Yet, there are others for which there are no effective vaccines or drugs.

For such diseases the choice in their control is the institution of measures that will reduce the threat and not only to keep out such diseases but also to make poultry operations profitable. Bio-security is a feasible and cost effective means to reduce disease threat. Biosecurity should involve all operators in the poultry industry viz-poultry producers, feed millers, transporters, egg sellers and traders in live poultry.

WHAT IS BIOSECURITY

Biosecurity refers to measures that protect the health of livestock and poultry by preventing the entry/escape of disease agent into or out of livestock or poultry production unit. It is a concept for the prevention of entry or escape that must be practiced by farmers and is most successful when practiced by a group of neighbours, commercial operators or a whole community. Biosecurity is the cheapest and most effective means of disease control available. It is job security and the most important investment poultry farmers in particular can make.

CHAIN OF INFECTION

The chain of infection involves a pathogen, a reservoir and a mode of transmission to a susceptible host.

Biosecurity involves the break in the chain of transmission .The backbone of biosecurity is the control of pest, movement of people, traffic control, cleaning and disinfection.

HOW BIOSECURITY CAN PREVENT THE SPREAD OF DISEASE

- Proper biosecurity can prevent the spread of infection from
- Humans (hands, hair, clothing, footwear)
- Vehicles (contaminated vehicles and equipment)
- Animals (domestic and wild, including rodents)
- Carcasses (those that are improperly disposed of) and manure, litter, debris and feathers and
- Flocks (other people's backyard flocks, particularly if the birds are housed outside)

GUIDELINES AND RECOMMENDATIONS FOR COMMERCIAL POULTRY FARM OPERATORS

One of the most common breaks in biosecurity is the entry of people bringing in contaminated materials

SOLUTIONS

- Do not allow strangers access to where poultry are raised
- Provide protective clothing, including boots, to visitors
- Provide footbaths with disinfectants for boots
- Ideally, all farm workers and visitors should take full shower and use cloths from the farm
- Cloths used on the farm should not leave the farm.
- Producers who use outside workers for assistance should ensure that these workers do not have poultry of their own.
- Producers should know the origin of their feed and water and should check quality periodically.
- Family and farm workers who have visited another farm etc disinfect shoes upon arrival at their own farm
- All visitors must sign a log book showing if they have visited other farms in the past 10 days.
- Where there are wells they should be protected from wild birds.

INTRODUCTION OF DISEASE THROUGH EQUIPMENT OR INSTRUMENTS

The reuse of equipment (e.g. egg trays) and purchase of used equipment (e.g. feeders) represent high risk activities

SOLUTIONS:

- Clean and disinfect equipment and instruments to be used.
- Porous materials, such as wood and fibre, are more difficult to disinfect than synthetic materials; use non-porous materials.
- Cars especially taxis and trucks are not allowed near bird pens or the wheels and under carriages decontaminated just outside or inside the farm entrance.
- Cages and equipment taken off farm are disinfected upon return.
- Visitors are never allowed inside bird pen.
- New birds are kept separate from the rest for at least 2 weeks.
- Birds returned from bird markets are kept at least 10 meters from other birds.
- Paper egg trays are destroyed after each use.
- Avoid exchanging old egg trays.

SALE OF POULTRY PRODUCTS

- Sales point for eggs and live poultry should be located far about 200 metres from birds either at the entrance of the farm or outside the premises where birds are kept
- Catching of spent layers or matured broilers for sale should only be done by employees of the farm (not by market women or live bird market operators who move from farm to farm)
- Transport cages or baskets should not be allowed near your birds (restricted to sales point only)

INTRODUCTION OF DISEASE BY POULTRY INCUBATING OR DISEASED

SOLUTIONS:

- Ensure the poultry to be introduced are healthy
- Vaccinate only healthy poultry.
- Establish a quarantine area where new poultry are housed away from poultry already on the farm; allow at least 30 days before putting them together with the rest of your flock.
- Use separate workers to handle different poultry or handle new poultry last.
- Establish mechanisms to separate wildlife from poultry farms.
- Exclude access of cats, dogs, rats and wild birds.
- Birds brought back from fair or exhibition should be separated and watched for at least 2 weeks

CONCEPT OF "ALL-IN-ALL-OUT"

- Refers to exclusion of introduction of new poultry, and equipment and feed once production has started.
- This diminishes health risk to growing broilers.
- Once the age for marketing is reached, all poultry are removed and sent to the market or abattoir.

Keep It Clean

- Farm workers wash or disinfect hands just prior to each entry to a pen.
- Farm workers are provided with a change of shoes, coveralls each time they enter poultry buildings.
- An effective disinfectant is used on the farm.
- All bird areas and equipment that come in contact with birds or their excrement is decontaminated at least once a week.
- Dead bird disposal area well removed from bird area.
- A pest control program for rats and mice is used.

Keep Your Distance

- The farm has gate that is kept locked.
- The farm has a perimeter fence.
- The bird area is fenced to allow distinction between bird area and other areas on the farm.
- All birds are kept in pens or buildings.
- Buildings are kept locked when no personnel are inside.
- Building is screened to prevent wild birds from entering.
- Employees are not allowed to raise their own birds or visit live bird markets.

Know the Warning Signs of Infectious Bird Diseases.

- Owner/manager knows signs associated with diseases of birds.
- A flock mortality record is kept with each flock.
- Bird mortality is recorded daily.
- Vaccinations with type and lot no. are recorded
- Clinical signs of disease are recorded.
- Unusual bird behavior is recorded.

Protect Yourself, Family and Community

- Dead birds are not left lying around.
- Normal dead birds are disposed of properly by deep burying or burning.
- Carcasses are never thrown into rivers, lakes or other water bodies.
- Manure/bedding material is allowed to decompose for several weeks before applying to fields.

When Any Poultry Disease Outbreak is reported in Your Area

- Be sure all birds are penned up.
- Always change into fresh clean cloths and wash your hands before handling your birds.
- If birds die, notify authorities immediately.
- Do not visit other farms.
- Do not bring new birds to your farm.
- Avoid all visitors on your farm.

Report Sick Birds

- Report any unusual signs of disease or unexpected deaths among your birds as soon as you see them.

DENSE VEGETATION GROWTH CLOSE TO POULTRY HOUSES:

- Dense vegetation, such as grass and weeds, is home to insects and rodents that may be carriers of infectious diseases.
- Regular grooming is recommended and mowing crews should not have access to poultry houses.

CLEANING AND DISINFECTION

- There are a number of ways to destroy disease causing organisms.
- These include steam cleaning and use of chemical disinfectants.
- Soil and organic matter rapidly inactivate most disinfectants
- Disease causing organisms are susceptible to a wide range of disinfectants including detergents.
- The best are detergents, hypochlorite, alkalis, gluteraldehyde, Virkon, Quincide and Timsin.
- Aerosol application of gluteraldehyde suitable for fans and similar equipment.
- Formaldehyde gas for electrical equipment and decontamination of hatcheries.
- Thoroughly disinfect poultry houses including ceilings and equipment.

QUICK DISINFECTION

- Allow sufficient contact time for the disinfection to take effect
- Disinfecting boots in a foot bath requires that boots are cleaned to remove organic matter before stepping into foot bath; allow ample time to soak before stepping out.

DIRTY FOOT BATHS:

- Foot baths which are noticeably dirty will not work.
- Foot baths should be changed at least daily, more frequently in high traffic areas.
- Foot baths must be kept inside or covered, to reduce contamination and inactivation by sunlight or dilution by rain

CLEANING AND DISINFECTING ON DIRTY SURFACES:

- Cleaning equipment and vehicles on muddy surfaces is ineffective
- Wash vehicles and other heavy machines on clean, hard surfaces, such as a concrete panel
- A high pressure sprayer is recommended to ensure all grit is washed away prior to disinfection as organic matter inactivates disinfectants.

PRESENCE OF LITTER CLOSE TO POULTRY HOUSES:

- Composted litter and litter from same farm may not be critical
- Litter of an unknown origin can be a major source of infectious agents.
- Any litter should be kept 300 meters away at a minimum.

IRREGULAR WORKFORCE ON THE FARM:

- Routine workflow can help minimize cross-contamination between poultry houses especially where flocks vary in ages.
- When caring for your flock, start from youngest to oldest.
- There is a greater possibility that older birds could be carrying infection such as AI.

OUTSIDE ANIMALS ON THE PREMISES:

- Outside animals, such as dogs, cats or stray animals should not be allowed to roam freely within the premises.
- If animals must be present, they should be under strict control at all times and should never be allowed inside the poultry houses.

UNKNOWN HEALTH STATUS OF FLOCK:

- Monitor the health of your flock.
- A programme should be put in place to watch over your birds.
- Avoid the introduction of infected birds or eggs.
- Early detection of any disease is critical to minimizing loses.

PRESENCE OF WILD BIRDS ON THE PREMISES:

- Wild birds can be a source of AI and other diseases
- Efforts should be made to keep wild birds away from inlets (windows, doors other openings) of buildings on the premises. Ensure facilities are properly fenced in.
- If birds are raised outdoors, measures should be put in place to minimize their contact with wild birds.

HOUSEHOLD POULTRY

- Species should be separated in time and space to avoid mixing of different species.
- Poultry house should be fenced off from main human dwellings within the compound.
- Local free range birds should be kept away from 'commercial" household poultry.
- Flock owners should follow all other biosecurity measures applicable to commercial poultry operations.

BIOSECURITY AT LIVE BIRD MARKET

- Sectioning of markets in time and place to avoid mixing of species.
- Improvement of hygiene.
- Proper disposal of waste
- Disinfection of materials leaving markets going back to the farm.
- Unsold animals should remain at the market and not returned to the farm ("live-in-dead out" principle)
- License to sell (includes adequate education)

STEPS TO IMPROVE BIO-SECURITY AT LIVE BIRD MARKET

- Do not trade poultry that look sick.
- Do not sell the carcass of a dead bird.
- Do not trade birds of unknown origin.
- Do not use wooden coops.
- Do not let unsold birds accumulate
- Do not allow discarded or seldom used furnishings in or equipment to remain in or near your market place.
- Traders should clean holding pens at least once weekly and regularly clean and disinfect transport cages.
- Where slaughter is done, proper hygiene should be maintained at all times

RECORD KEEPING AT LIVE BIRD MARKETS

- Keep record of origin of birds at the live bird market for purposes of disease trace back.
- Keep record of people who buy live birds from the market through a receipt system.
- Keep record of mortalities at the live bird market.

BIOSECURITY FOR PET-BIRD OWNERS

- When buying a pet bird, request certification from the seller that the bird was legally imported or acquired.
- Isolate new birds from your other birds for at least 30 days.
- Restrict assess to your birds, especially from people who own birds that are housed outside.
- Keep your bird away from other birds.
- Clean and disinfect your clothing and shoes if you have been near other birds, such as at a bird club meeting or bird fair or at a venue with live poultry.
- Wash your hands thoroughly with soap, water and disinfectant before and after handling your birds
- Keep cages, food and water clean on a daily basis.
- Remove feed from bags; place it in clean, sealed container and throw bags away.
- Do not borrow or share bird supplies.
- If it becomes absolutely necessary to borrow or share bird supplies, you must clean and disinfect items before bringing them home.
- Know the warning signs of infectious bird diseases.
- If your bird shows unusual signs of diseases or dies unexpectedly, call your local veterinary worker.

BIOSECURITY FOR HANDLING WILD BIRDS

- Wild birds can carry several diseases, including avian influenza. Observe wild birds from a distance, so you are protected from possible exposure to pathogens and you minimize disturbances to the animal.

- Here are some tips if you come into contact with wild birds.
- Do not rub your eyes, eat, drink or smoke until you have thoroughly washed your hands with soap and water.
- Do not pick diseased or dead wild birds with your bare hands.

- Hunters should follow routine precautions when handling wild birds. These include (1) not handling or eating sick birds, (2) wearing disposable gloves when handling or cleaning wild birds, and (3) thoroughly washing knives, equipment, and surfaces that come in contact with wild birds.
- Hunters should not eat, drink, or smoke while handling animals.
- Wild birds and game should be thoroughly cooked before eating.

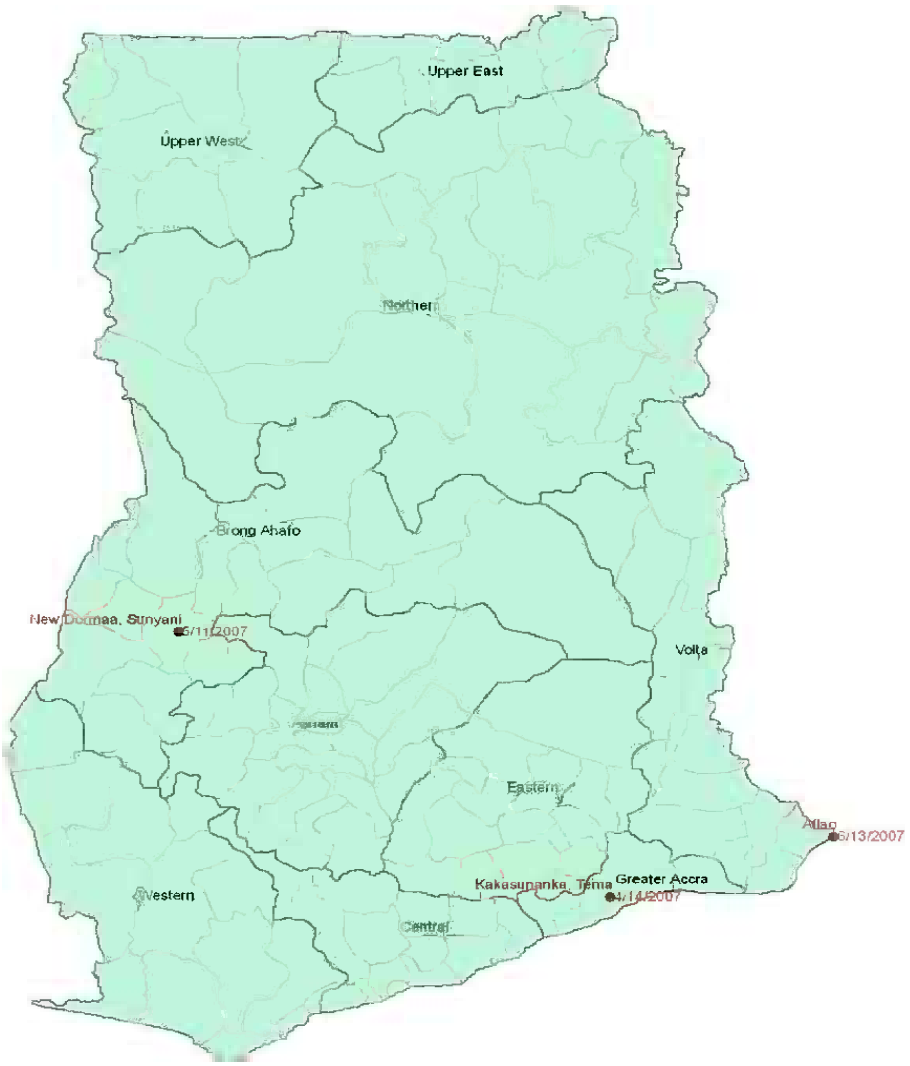
Reference

Empres-Transboundary Animal Disease Bulleting No 25 –January-June 2004

Biosecurity Guide for Poultry and Bird Owners-United States Department of Agriculture, Animal and Plant Health Inspection Service.

Scientific Papers From Regional Workshop on Approaches to Bio-Security in the Live Bird Market 15-17 August 2007, Bamako, Mali.

Appendix 5: HPAI H5N1 Outbreak locations in Ghana in 2007.



Source: Data from VSD. Map prepared with help from IFPRI. (2008).

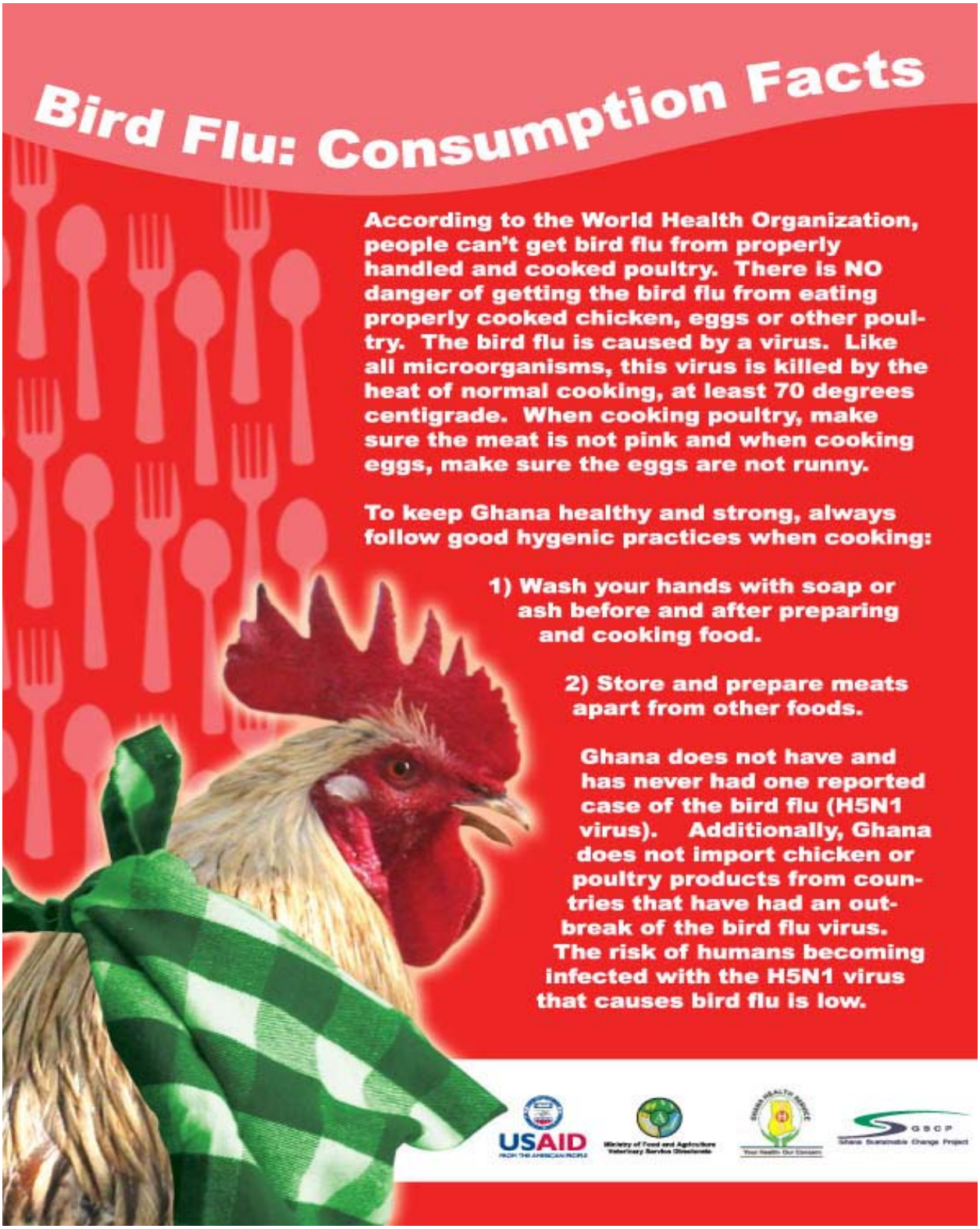
Appendix 6: Cost estimates: Poultry Compensation Proposal by GNAPF. 2006

Cost Analysis of Products From Production Point Through Lay to Sale Based on Input Cost Per Age of The Bird

	Broiler Feed Cost Per Kg To Producer		**Amount (¢)**
1	Cost of 45kg bag of prepared feed		148,909.62
2.	Packaging & Bagging		1,800.00
3.	16% overhead costs		24,113.54
4.	5% Profit margin		183,564.32
5.	Cost per kilogram of prepared feed		4,079.21
6.	Total consumption of 2kg live weight bird (Feed conversion ratio 2:1)		20,396.04
	Producers		
1.	Cost of Feed per bird		¢ 20,396.04
2.	Cost of Day Old Chick (DOC)		¢ 8,000.00
3.	Cost of Medication (5% of cost of feed)		¢ 1,019.80
4.	Cost of Finance		¢ 1,324
5.	Depreciation of equipment		¢ 122.38
6	Operational cost: Lab., Admin & Utilities		¢ 2,448
7.	Selling (7.0%)		¢ 2,151.77
8.	Cost of 2kg Live Bird	TOTAL	**¢ 35,461.22**
	Processors		
1.	Cost of 2kg live bird		¢ 35,461.22
2.	Processing and storage		
3.	Transportation		
4.	Disinfection & Waste Disposal		
5.	Distribution		
6.	Packaging (Cut parts) & Administrative costs		
7.	Depreciation (5% of cost of processing and packaging)		
8	Selling (5%)		
9.	Cost per 1.3 kg Dressed bird	TOTAL	**¢ 35,461.22**
10.	Cost per kilo Dressed bird		**¢ 27,277.86**

Source: USAID/QHP 2006

Appendix 7A: Poster by Communication subcommittee for AI public education (Source. AIWG)



Appendix 7B: Banner/Poster by Communication subcommittee for AI public education (Source: AIWG)