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HPAI PRO-POOR HPAI RISK REDUCTION

Overview on Poultry Sector and HPAI Situation for Indonesia with Special Emphasis on the Island of Java - Background Paper

Bambang Sumiarto
Bustanul Arifin

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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.

Authors

Bambang Sumiarto, Faculty for Veterinary Medicine, Gadjah Mada University, Yogyakarta, Indonesia
Bustanul Arifin, InterCAFE (International Center for Applied Finance and Economics), Bogor Agricultural University, Jl. Pajajaran, Bogor 16151, Indonesia

Disclaimer

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More information

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

List of Abbreviations

AI	Avian Influenza
CMU	Campaign Management Unit
DFID	Department for International Development
DOC	Day Old Chicks
FAO	Food and Agriculture Organisation
HE	Hatching Eggs
HPAI	Highly Pathogenic Avian Influenza
HPAI H5N1	Highly Pathogenic Avian Influenza (HPAI) of the subtype H5N1
GDP	Gross Domestic Product
ILRI	International Livestock Research Institute
IFPRI	International Food Policy Research Institute
LDCC	Local Disease Control Centre
NA	Not applicable (includes also if no information was available)
NAQS	National Animal Quarantine Services
ND	New Castle Disease
NSP	National Strategic Plan
PDR	Participatory Disease Response
PDS	Participatory Disease Surveillance
PPE	Personal Protective Equipment
PPP	Purchasing Power Parity
SOP	Standard Operating Procedures
UGM	Gadjah Mada University
WHO	World Health Organisation

1. Introduction

The emergence of Highly Pathogenic Avian Influenza (HPAI) of the subtype H5N1 and the potential threat of a global human pandemic have been issues of great concern to the international community since its regional and global spread since 2003. At the same time, there has been less emphasis placed on the assessment of the effects of implemented mitigation strategies on the livelihoods of smallholder farmers and their families in affected developing countries. While policymakers must take rapid and effective action to control the disease, some of their actions may lead to a number of direct and indirect effects that disproportionately negative impact the poor.

The Department for International Development (DFID) of the United Kingdom has recently funded the Pro-Poor HPAI Risk Reduction Strategies Project that aims to help decision makers in developing countries generate 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 livelihoods, particularly of smallholder producers in developing countries. This project is being implemented in eight countries in Africa and Southeast Asia, including locations where HPAI has not yet been reported, where sporadic outbreaks have occurred, and where the disease is endemic. The International Food Policy Research Institute (IFPRI) and the International Livestock Research Institute (ILRI) are responsible for project activities in Africa and Indonesia.

HPAI, of the subtype H5N1, first appeared in Java in August 2003 (and officially declared in January 2004) and spread rapidly to other parts of the country; since 2006, it has been considered to be endemic in many parts of Indonesia (MoA, 2007; OIE, 2006; Promed-mail, 2003; Sims et al., 2005). Its persistence represents a serious risk to animals and public health in the region. Frequent outbreaks are observed in rural areas where backyard poultry are kept. Humans are rarely but consistently infected. With 108 confirmed fatal human cases since 2005, Indonesia is the country with highest number of human deaths (WHO, 2008).

A first step in initiating this project is to compile and assess, in the form of a background paper, the current state of knowledge of poultry systems and their place in the larger economy, the current HPAI situation and its evolution, and institutional experiences within its control. This information is of critical importance to underline existing information, identify research gaps, and better target further research activities in the project.

This background paper was jointly developed by researchers from two different universities in Indonesia; an economic scientist from the University of Bogor and a veterinary epidemiologist from the Gadjah Mada University, Yogyakarta.

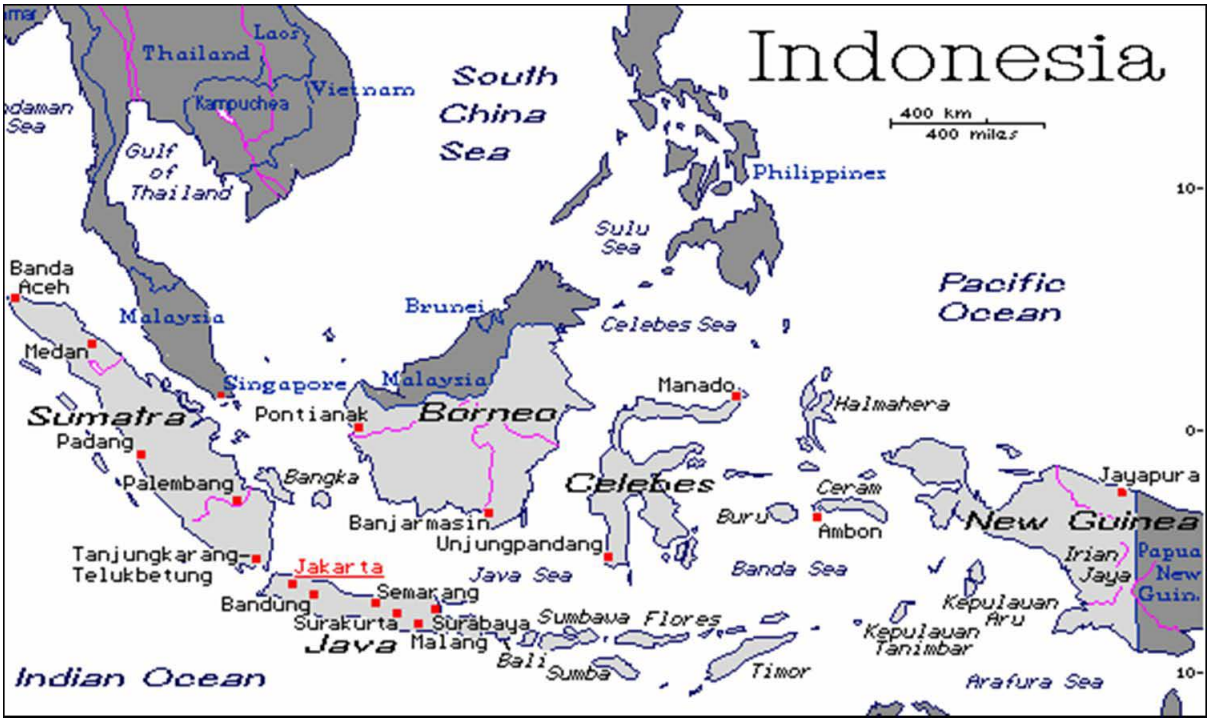
Due to the limited time given for the paper's preparation and difficulties in obtaining consistent and updated data for the entire country, which covers nearly 2 million km^2 and reaches from Aceh Province in the Northwest of Sumatra to the Western part of Papua, it was decided to focus on the Island of Java. Java represents 60% of the human and 70% of poultry population of Indonesia (MoA, 2007). Cases of HPAI H5N1 are continuously reported for poultry and constantly but sporadically reported for humans (see ANNEX Figure 1-3).

In the preparation of this paper, if some of the information on the poultry sector was not available for the country, or specifically for Java, a group of experts was asked for their opinion. The expert panel consisted of a group of veterinarians: 2 epidemiologists, 1 field veterinarian and 1 veterinarian employed in a commercial farm.

2. Vital Country Statistics

Land area of Indonesia covers about 1,919,445 km^2 (Figure 1), spreading from Aceh Province in the Northwest of Sumatra to the Western part of Papua (World Economic Fact book). Agricultural land in Indonesia is about 45.6 million hectares (CIA Fact book), much larger than agricultural land in Thailand (18.5 million hectares), the Philippines (12.2 million hectares), and Malaysia (7.9 million hectares). The national capital of Indonesia is Jakarta, a metropolitan area with a population of over 9 million; Greater Metropolitan Jakarta includes the suburban cities of Tangerang, Bekasi, Depok and Bogor and has a population of 14 million people (Central Agency of Statistics). The official language of Indonesia is Bahasa Indonesia while English and some local languages are treated as secondary languages.

Figure 1: Country map of Indonesia and bordering countries



The 2008 estimate of the total population of Indonesia is about 235,672,000 people (World Economic Fact book), with a population density of 122.78. people/km^2. According to the 2000 Population Census, the growth rate of the Indonesian population is 1.49 % per year, with a possible increase in recent years (Central Agency of Statistics). The share of the rural population in Indonesia is 58%, while 42% is urban population. The annual rural population growth rate between two census points in 1990 and 2000 was nearly 1%, which is much lower than the urban population the growth rate (3.12% per year, Central Agency of Statistics).

The total Gross Domestic Product (GDP) of Indonesia in 2008 is estimated at US$906,664 million, measured in purchasing power parity (PPP), so that GDP per capita is about US$3,848 (World Economic Fact book). The real GDP growth rate of Indonesia in 2008 is 5.99% per year (World Economic Fact book), which is slightly lower than the government estimate of 6.30% (Central Agency

of Statistics), primarily due to increasing prices of food and fuel. Estimates of the Indonesian economy are also expressed in Gross National Income (GNI) which, according to PPP method, is US$3,310 p.c. (World Development Indicator of the World Bank) or, according to Atlas method of the World Bank, is US$1,420 p.c..

The agricultural GDP of Indonesia in 2008 is estimated at US$125,119 million, and the share of agricultural GDP to the total GDP is 13.8%. The growth rate of agricultural GDP is estimated at 6.0% (Central Agency of Statistics), which is relatively higher than the growth of recent years. This high growth rate of agricultural GDP is primarily brought about by high prices of agricultural crops, such as in the plantation and fisheries sub-sectors.

The average Human Development Index (HDI) of Indonesia in 2004 was 66, with a very high variation from 76 in the Jakarta Metropolitan to 58 in the Province of West Nusa Tenggara (Central Agency of Statistics). The poverty rate in 2007 was 16.6%, with poverty incident in rural areas at 20.4 %; much higher than the rate of poverty in urban areas of 12.5%. Life expectancy at birth in 2008 is 68 years, the infant mortality rate is 26 per 1000 live births, and the literacy rate of female youth is 99% (World Development Indicators).

The distribution of population in Indonesian is unequal among the major islands in the country. Nearly 60% of the population lives on Java Island, which constitutes only less than 7% of Indonesia's total land area. Java Island is one of the most populated islands in the world, where the population density is nearly 1000 people/km^2. Fertile lands, a large number of volcanoes and the oldest civilization in history are among the factors contributing to the high population density in Java. On the other hand, the islands of Kalimantan and Papua, which have land areas that are four and five times higher than Java island, are only inhabited by 5% and 2% of the Indonesian population respectively. The population densities per square kilometre on the Off-Java islands are about 9 people/km^2 in Papua, 20 people/km^2 in Kalimantan, and 78 people/km^2 in Sulawesi (Central Agency of Statistics).

Another important aspect of Indonesian population is a growing trend of urbanisation, especially in the last decades (Table 1). According to the 2000 Population Census, the percentage of urban population in the country is 42%, which was nearly a twofold increase from 22.3% in the 1980s. The high rate of urbanization in the last decades has been argued as the most important factor of the high urban population in Indonesia. These new urban groups do not depend on agricultural income, which was a common source for employment for the rural population. Urban food consumption is mainly based on prepared food, which most inhabitants get them from supermarkets and other convenient stores. However, non-prepared food remains common in rural areas.

All inhabitants of the City of Jakarta are classified as urban. There has been no more rural population in Jakarta since 1990. The percentage of urban people in all other provinces in Java is between 40% and 58%, which also indicates that infrastructures such as roads, power and electricity on the island are relatively better than those in Off-Java islands (see Table 1). A high percentage of urban people in the Province of East Kalimantan (57.6%) reflects that some enclaves and clusters have been commonly build up related to the area's natural resources (oil-rich province). One should note that the high percentage of urban population and its respective high growth rate does not reflect the welfare status of the population in the city. In fact, many people live in slum urban areas in the city of Jakarta, Surabaya, Medan, Bandung and Makassar.

Table 1. Percentage of Urban Population and their Respective Growth

Province	% of Urban Population			Urban Growth (%)	
	1980	1990	2000	1980-90	1990-00
Nanggroe Aceh	8.9	10.8	23.6	1.95	8.13
North Sumatera	25.5	35.5	42.4	3.36	1.79
West Sumatera	12.7	20.2	29.0	4.75	3.68
Riau	27.2	31.7	43.7	1.54	3.26
Jambi	12.7	21.4	28.3	5.36	2.83
South Sumatera	27.4	29.3	34.4	0.67	1.62
Bengkulu	9.4	20.4	29.4	8.06	3.72
Lampung	12.5	12.4	21.0	-0.08	5.41
Kep. Bangka Belitung	-	-	43.0		
DKI Jakarta	93.7	100.0	100.0	0.65	0.00
West Java	21.0	34.5	50.3	5.09	3.84
Central Java	18.7	27.0	40.4	3.74	4.11
D.I. Yogyakarta	22.1	44.4	57.7	7.23	2.65
East Java	19.6	27.5	40.9	3.44	4.05
Banten	-	-	52.2		
Bali	14.7	26.4	49.8	6.03	6.55
West Nusa Tenggara	14.1	17.1	34.8	1.95	7.36
East Nusa Tenggara	7.5	11.4	15.9	4.28	3.38
West Kalimantan	16.8	20.0	25.1	1.76	2.30
Central Kalimantan	10.3	17.6	27.5	5.50	4.56
South Kalimantan	21.4	27.1	36.3	2.39	2.97
East Kalimantan	40.0	48.8	57.6	2.01	1.67
North Sulawesi	16.8	22.8	37.0	3.10	4.96
Central Sulawesi	9.0	16.4	19.7	6.18	1.85
South Sulawesi	18.1	24.5	29.4	3.07	1.84
South East Sulawesi	9.4	17.0	20.8	6.10	2.04
Gorontalo	-		25.5		
Maluku	10.9	19.1	25.9	5.77	3.09
North Maluku			29.5		
Papua	21.4	24.1	22.2	1.20	-0.82
Indonesia	**22.3**	**30.9**	**42.0**	**3.32**	**3.12**

Source: Calculated from Population Census, 1980, 1990 and 2000

3. An Overview of the Economics of the Poultry Sector

The contribution of the livestock sector to agricultural GDP in 2006 was 12.75%, while the share of the sector to total GDP was 1.80% (Central Agency of Statistics). The rate of growth of the livestock sector was 4.47% per year in the period of 2001-2006, which was high compared to the negative growth of 1.92% during the peak of economic crisis from 1998-2000. The high dependency on imported feed and sharp increase in the price of day-old chicken (DOC) are among the main contributors to such a negative growth; as small and medium scale poultry companies were not able to afford these inputs. Interestingly, the livestock sector has experienced a revival in the last three years, primarily due to a more profitable poultry sector, despite the presence of HPAI in Indonesia since 2003.

The number of people employed (in primary jobs) in the agricultural sector in 2007 was 41.21 million out of a total labour force of 99.93 million (Central Agency of Statistics), a decline from 44.0% of the share in 2005. The 41.2% share in employment of the total labour is considered high, compared to causing a 14% share burden of the agriculture sector to support a growing population, especially in the GDP urban areas. The rate of decline of the share of agricultural GDP to the total economy is much faster than the rate of decline of the declining share of the labour force in the agricultural sector. This also implies that the structural transformation of the Indonesian economy has not been completed. Labour involved in the livestock sector – both at the household level and the commercial scale – is nearly 3 million people, which is 3% of the total labour force in Indonesia, and equivalent to about 7.3% of the total labour force in the agricultural sector. The contribution of the poultry sub-sector to the livestock sector is much higher than that of the cattle sub-sector.

The role of the livestock sector in the economy is very important, including foreign reserves earned from export, primarily from leather (US$ 97.75 million), milk (US$ 90.15 million), and pig (US$ 25.9 million). However, Indonesia is still dependent on the import of livestock products, primarily for milk (US$ 399.17 million), leather (US$ 66.44 million) and cattle (US$ 43.65 million) [Central Agency of Statistics]. The import share of the poultry sub-sector is very small, only 0.28%; hence, Indonesia is fulfilling the consumption of poultry and poultry products mostly from domestic production. This implies that restricting the import of poultry and poultry products, for example in the case of an HPAI outbreak in neighbouring countries, will not have a significant impact on the domestic economy. The HPAI effects are mostly domestic, as domestic consumers have a number of options to substitute poultry products with other meat and protein sources.

The development of livestock in Indonesia also coincides with the Livestock Revolution of the 1980s, a high growth rate in the poultry sector in both developed and developing countries. The demand for meat, egg, and milk has increased significantly as the economy grew and average income rose. In 1999, the amount of consumption for cattle and poultry meat, eggs, and milk was 1.7, 0.6, and 1.1 million tons, respectively. These amounts were equivalent to 4.1 kilogram of meat per capita per year, 2.7 kilograms of eggs per capita per year, and 5.09 kilograms equivalent of milk per capita per year, respectively. In 2003, these amounts increased to 6.08 kilograms of meat per capita per year, 4.47 kilograms of eggs per capita per year, and 7.28 kilograms equivalent of milk per capita per year.

In the poultry sub-sector, the consumption of chicken meat (broiler and non-broiler) increased slightly during the period of 2004-2006, despite HPAI outbreaks in some regions in Indonesia (Table 2). The consumption of chicken meat increased from 2.08 kilograms per capita per year in 2004 to 2.3 kilograms per capita per year in 2006. However, the consumption of eggs decreased from 3.45 kilograms per capita per year in 2004 to 3.04 kilograms per capita per year in 2005 and reviled again increasing to 3.31 kilograms per capita per year in 2006 (Central Agency of Statistics). The income elasticity of demand for poultry products in Indonesia is very elastic, shown by a significant decrease (5.25%) in its consumption during the economic crisis at the end of the 1990s. After the crisis, the level of consumption of poultry products increased by 9.75%, as the consumers, including the rural poor, saw that poultry products were the most affordable protein source. One should note that the substitution elasticity of demand for poultry products is also high, implying that when the prices of poultry products increase, consumers easily substitute the poultry consumption with beef, fish, etc (Oktaviani, 2008).

Table 2 provides a summary of figures for production and consumption of animal products in Indonesia for the years 2004-2006, and Table 3 shows the volume and value (in US$) of exports and imports for major livestock products for Indonesia for the years 2004 and 2005.

Table 2: Production and Consumption of Meat, Egg, and Milk, 2004-2006

No	Commodity	Production (000 ton)			Consumption (kg/capita)		
		2004	2005	2006	2004	2005	2006
	Meat						
1	Beef meat	358.06	286.96	311.44	1.23	1.06	1.15
2	Buffalo meat	32.19	30.44	31.60	0.10	0.10	0.10
3	Goat meat	45.71	40.48	42.62	0.14	0.14	0.14
4	Mutton meat	52.85	37.86	41.52	0.16	0.12	0.13
5	Pork meat	176.98	157.88	163.13	0.51	0.55	0.56
6	Horse meat	1.31	1.33	1.40	n/a	n/a	n/a
7	Native chicken meat	269.47	274.02	293.44	0.69	0.69	0.73
8	Broiler meat	813.16	749.35	918.25	2.08	1.90	2.30
9	Duck meat	20.19	19.41	20.27	0.05	0.05	0.05
10	All Edible Offal	250.44	219.27	246.58	1.33	1.16	1.27
	Egg						
1	Native chicken	143.15	175.43	181.10	0.57	0.57	0.58
2	Layer chicken	762.04	681.15	751.04	3.45	3.04	3.31
3	Duck	173.22	194.90	201.70	0.66	0.73	0.75
	Milk						
1	Fresh milk domestic	549.95	535.96	577.63	2.14	2.06	2.19
2	Fresh milk imported	0.00	0.00	0.00	7.33	7.26	7.16

Source: Directorate General of Livestock Production of Ministry of Agriculture, 2007

Table 3: Export and Import of Major livestock products, 2004-2006

No.	Commodity	Volume		Value (US$ million)	
		2004	2005	2004	2005
	Export				
1	Leather (1000 sheet)	45,222.8	75,663.2	73.03	97.73
2	Milk (ton)	40,935.1	45,018.5	61.61	90.15
3	Pork meat (ton)	2,770.0	6,217.7	1.36	3.06
4	Chicken meat (ton)	100.9	20.1	0.16	0.09
5	Poultry (head)	1,000.0	100.0	0.00	0.01
6	Pig (head)	402,405.0	402,405.0	20.42	25.90
7	Egg for breeding (ton)	19.8	10.1	0.08	0.01
	Import				
1	Leather (1000 sheet)	59,408.0	51,818.6	91.17	66.53
2	Milk (ton)	165,411.5	173,084.4	329.38	399.17
3	Pork meat (ton)	179.6	39.0	0.24	3.29
4	Chicken meat (ton)	1,313.9	3,978.4	1.03	3.80
5	Egg for food (ton)	245.1	707.0	0.13	1.97
6	Cow (head)	11,772.0	21,484.5	27.11	43.65
7	Egg for breeding (ton)	40.40	19.50	0.24	0.35

Source: Central Agency of Statistics (BPS), 2006

4. Review of the Poultry Sector and Actors

4.1 General Figures

According to livestock statistics from 2007, Indonesia has an estimated standing population of 317 million native/village poultry, 106 million layers, 175 million broilers and around 35 million ducks (Ministry of Agriculture, MoA, 2007). Thus, more than 620 million chicken and ducks are estimated to be the standing population of the country. These figures do not include quails, pigeons, geese and songbirds and do not consider the large annual turnover for some production systems and/or species; the annual turnover for broilers is estimated to be more than 1 billion and for native/village chicken around 630 million (MoA, 2007).

The island of Java hosts 70% of the total poultry population and 60% of the total human population of Indonesia (Agriculture and Consumer Protection, 2007). The growth of the poultry population in Java is faster than that on other islands, as Java has more household and especially commercial poultry businesses. The structure of the commercial poultry sector includes grandparent stocks and parent stocks, broiler and layers, feed mills, and drug and vaccine producers.

4.2 Breeding industrial poultry production in Java

Pedigree pure lines and great grand-parent stock are not present in Indonesia; except of these two production sections Indonesia ha grand-parent stock, parent stock for broilers and layers, farmed broilers and layers (see Table 4). Table 4 also provides an estimation of the current numbers for each of these production sectors for Java.

Primary breeding of commercial poultry production in Java consist of around ten big enterprises, which are PT. Charoen Phokphand, PT. Japfa Comfeed, PT. Wonokoyo, PT. Anwar Sirad, PT. Malindo, PT. Patriot, PT Cibadak, PT. Reza Perkasa, and BIP. These companies supply the breeding stock from which almost all the commercial poultry meat and table eggs are derived from in Java.

Table 4: Industrial poultry production in Indonesia (prediction and estimations for 2006 and 2007)

Breeding	Present in country	Number (2006)	Number (predicted for 2007)
Pedigree pure lines	No	-	-
Great grand parents	No	-	-
Grandparents stock	Yes	436,000	475,000
Parents stock broiler	Yes	10,330,000	11,000,000
Parent stock layer	Yes	1,000,000	1,000,000
Broilers	Yes	1,1150,000,000	1,250,000,000
Layers	Yes	87,000,000	94,000,000
Male layers	Yes	52,000,000	57,000,000

Source: The Indonesian Poultry Society Forum (2007) in MoA, 2007

4.3 Data on the commercial sector for Java

Indonesia has a large poultry industry. Production is mainly aimed to supply the national market, although some exports of processed products and one-day-old chicks exists, and may be important regionally. In 2004 and 2005, however, no export of live birds occurred (see also Chapter 8).

70% of Indonesia's total poultry population is located in Java. The total parent stock population in Java is about 7 million; production levels are 4.5 millions/week of layers and 16.5 million/week for broilers. In Java, the hatcheries (sector 1–2) produce about 25.8 million birds/week (Table 5).

The majority of parent stocks present in the country are of the following breeds: Cobb, Ross, Hybro, Logmann, Hubbard, and Arbor acres for broilers and ISA for layers (see annex table 1a-d). The commercial chicken sector and its marketing in Indonesia is dominated by about ten companies. In addition, nearly 70% of production is attributed to the three largest commercial companies, which are characterised by vertically integrated poultry production systems of substantial capacity. These companies are Charoen Phokphand (27%), Japfa Comfeed (23%), and Wonokoyo (19%), followed by other companies like Anwar Sirad, Malindo, Patriot Panca Prima, Cibadak, Reza Perkasa, BIP, Super Unggas Jaya, Samsung poultry and Manggis. The main locations of these enterprises are in West Java (Purwakarta, Sukabumi, Tangerang, Bogor, Serang, dan Indramayu), Central Java, East Java (Gempol, Jombang, Pasuruan, Batu, Singosari, Sukorejo, Mojokerto, Lamongan, Madiun), and the Yogyakarta Special Territory (Gunung Kidul). Life spans of grandparent stocks, parent stocks and Hatchery (Sector 1-2) are between 65 - 67 weeks. Life spans for broilers are usually 35 days and for layers around 80 weeks (see annex Table 1). Specific data, such as breeds, enterprises and their location, are presented in annex Table 1.

Table 5: Overview on commercial sector located in Java

Type	No. of birds	Lifespan of birds
Parent stock	7 million per cycle	65-67 weeks
Hatchery	25,800,000/week	-
Broiler	15,500,000/week	35 days
Layer	4,500,000/week	80 days

4.4 The poultry industry and support actors

Poultry industries in Indonesia vary from backyard poultry to commercial breeding farms. About half of commercial breeders present in the country use vertically integrated operations. However, most of the small to medium enterprises lack integration, DOC supply, hatchery egg suppliers, and feed mills. In addition, abattoirs belong to different actors.

There are four types of broiler industries in Indonesia (Muladno, et al., 2008):

1. Full vertical integration (A- Type), an enterprise that has all the business of the primary component (grandparent stock, parent stock, final stock, and abattoir) and contributing component (Feed mills companies, Medicine Company, and meat processing plant).
2. B-Type as semi-vertical integration, an enterprise which has all the business of the primary component (grandparent stock, parent stock, final stock, and abattoir), but only has one contributing component (feed mills companies or drug company, or meat processing plant).
3. C-Type (Partial vertical integration) has two primary components and one or two contributing components.
4. Non-vertical integration (D-Type) has only one primary component and only one or two contributing components.

Table 6 summarizes the different support actors, such as feed producers, transport of feed, chicken and eggs, vaccine producers and abattoirs (CSH). Feed mill companies, meat processing plants and abattoirs are linked to production systems. Feed, DOC and produced eggs are mostly transported using subcontracted transport companies. The table provided also figures in the throughput per year for selected actors, if data were available.

There are ten companies producing or supplying avian Influenza vaccine in Indonesia: PT Medion (Vaksiflu, lokal), Vaksindo (Medivac, local), Qilu Animal Health Product RRC, Qian Yuan Hao Biologicals, Co. RRC, Harbin Weike Biological Co. Ltd RRC, Harbin Weike Technology Dev Co. RRC, Laboratory AVI-Mex, Mexico, Boehringer Ingelheim, Vetmedica Mexico, Bio Imune Mexico, and Intervet, Netherlands. Poultry Vaccine Producers, including those that have cooperation with public agencies, are not integrated with other support service actors. There is a lack of information for Indonesia on which vaccine is used, in which quantities as well as the location and production sector. For most of the vaccines, there is insufficient information on their efficiency in general and for specific species. Vaccines are supplied by the public and private sector as well (see below).

Table 6. Support service actors (based on own data collection)

Actors	Number	Location	Throughput (birds per year)
Feed mills companies	2 branches All other NA	CP, Tangerang, Sidoardjo, Wonokoyo, Serang Banten dan gempol Pasuruan Japfa comfeed, Sidoarjo, Purwakarta, Sragen Anwar Sirad, Bogor, Serang Malindo Wonokoyo Suja, Samsung	1.85 millionston/year 1.2 million ton/year 1.6 million ton/year NA 120 ton/years 120 tons/years NA
Feed transport company	NA* (most feed company using other transport company)	NA	NA
DOC companies	2 branches All other consist of one branch (most using other transport company)	Charoen Phokphand Japfa Comfeed Wonokoyo Anwar Sirad Malindo	337,44 millions DOC 58,150 millions/years All others NA

		Patriot Cibadak BIP	
Companies transporting eggs	NA	All over Java Island	NA
Transport of broilers and spent layers to abattoirs	4 branches NA (most producers using own and frequently also other transport companies)	Charoen Phokphand , Five star Japfa C, Cikupa, Parung Anwar Sirad, Bellfood, Dellfood, Bogor	NA
Egg packing plant	NA	Non big company, but only small enterprise	NA
Meat processing plant	2 branches 1 branch 1 branch 1 branch	Charoen Phokphand , Bale Raya, Serang, Banten and Rungkut Surabaya Japfa Comfeed Cikupa, Tangerang Anwar Sirad, Bellfood, Dellfood, Bogor Wonokoyo MPP, Pasuruan	22.500 birds/days (Serang) 22.000 birds/days (Rungkut) 12.000 birds/days 10.000 birds/days
Abattoirs	2 branches All others 1 branch	Charoen Phokphand , - Baleraya, Serang - Rungkut Surabaya Japfa Comfeed, AgriNusa Unggas Jaya, Jakarta Barat Anwar Sirad, Bellfood, Dellfood, Bogor Wonokoyo	22,500 birds/days 22.000 birds/days (Rungkut) 12,000 birds/days 10,000 birds/days 20.000 birds/days
Poultry Vaccine Producers (some have own vaccinators)	10 (around 20 vaccines provided)	-PT Medion* -Vaksindo (local) -Qilu Animal Health, Product, RRC -Qian Yuan Hao Biologicals, Co, RRC	Import = 191 million doses, Local = 55 million doses, Free sale for public 18 millions

		-Harbin Weike Biological Co, RRC -Harbin Weike Technology Co, RRC -Laboratory AVI-Mex, Mexico -Boehringer Ingelheim, -Vetmedica, Bio Imune, Mexico -Intervet, Netherlands	
Specialized poultry vets or equivalent	More than 100	All feed, chicken, vaccine companies have own vets	NA

Comments: Some companies do not give information about throughput (birds per year)

4.5 Backyard Poultry Production

Backyard poultry production is a significant contributing factor to the livelihood economics of most rural households in Java. This fact provides an option for restructuring backyard poultry farms to control HPAI systematically with better approaches. The total population of Kampong (village) chickens in Java is estimated to be 106 million birds reared by approximately 60-70% of Java's population of 135 million. Backyard poultry in Java lack basic hygiene measures, mixes of different domestic poultry species and ducks scavenged on the harvested paddy. All these factors may greatly increase the risk and spread of AI. Table 7 provides an overview on the backyard poultry sector in Java, including estimates for song birds and wild birds.

a) Farming systems

Kampong chickens are usually kept to provide an additional income for the majority of villagers. They provide some small complementary income in addition to the traditional farming practices. Only a few farmers produce kampong chickens as their core livelihood business.

b) Production system

There are two rearing systems of kampong chickens: intensive/semi-intensive and extensive traditional. Most kampong chickens are kept traditionally, meaning they scavenge during the daytime and are kept inside at night. A small number are managed intensively/semi-intensively using a method similar to the "all in all out" system. The majority of kampong chickens are reared using an extensive traditional approach.

c) Type of commodity

Approximately 70% of the backyard poultry sector keeps kampong chicken, while only the remainder keep a mixture of kampong chickens, ducks, Muscovy ducks, quails, pigeon etc. (Anonymous, 2007a-d).

d) Origin of feedstuff

In backyard poultry farms, only a small number of farmers procure their feed from feed mill companies. About 40% of farmers produce their own poultry feed based on a traditional approach using local produced feedstuffs and 50% rely on household left-over foods.

e) Production scale

It is estimated that on average in Java the level of ownership of backyard poultry is around 50 birds, ranging from several birds to several hundred birds. However, most farmers may rear less than 50 birds (expert opinion).

f) Health management

Some farmers, who keep about 50 birds, apply New Castle Disease (ND) vaccination. Contrary HPAI vaccination usually requires the government intervention and program (e.g. AI vaccination is free in sector 4 farms). The problem for AI vaccination in village/native (so called kampong chicken) chickens is reaching a sufficient coverage. The current level of coverage is estimated to be about 50% without the booster application. However, during the last two years, less kampong chickens were vaccinated against AI due to limited stocks of the vaccine. AI vaccination is still controversial in terms of effectiveness and the probability of introducing new strains of zoonotic importance. ILRI base line surveys at the District level in Java have shown that some farmers might reject the AI vaccination due to side effects (see also risk factor chapter, vaccination). Moreover, some farmers even trade chickens in an outbreak area (ILRI 2008). These farmers do not see the economic value of the vaccination, as they are used to selling their chickens immediately when any clinical symptoms are observed to avoid further losses.

Table 7. Backyard poultry-keepers (Anonymous 2007a-d) (Reports from Livestock Services West Java, Central Java, Yogyakarta Special Territory, and East Java, published 2007)

Species	Present in Java	Significant*	Numbers**	Distribution – geographical	Breeds
Chicken	Yes	60-70 %	7	All Districts of Java (West 29,319,161; East 40,058,195; Central 33,158,078 , Yogyakarta 3,970,670),	Kampong, Pelung, Kedu
Turkey	Yes	Not significant	1	Some district of Java,	Local Turkey
Duck	Yes	8 – 10 %	7	All province of Java (West Java 5,296,757, East Java 2,430,767, central 4,614,460, Yogyakarta 419,734)	Tegal, Magelang, Turi, Mojosari duck,
Moving ducks	Yes	2 – 3 %	7	Yogyakarta, Tegal, Brebes, Pemalang, Batang, Blitar, Kediri Mojokerto (Report ACIAR)	Tegal, Magelang, Turi, Mojosari Duck
Geese	Yes	Not significant	4	All districts of Java (Central java 94,686, West NA, East Java 564,437, Yogyakarta NA)	Local geese
Guinea fowl	Yes as pets	Not significant	1	NA	One breed Guinea fowl (ayam mutiara)
Quail	Yes	2 - 5 %	7	All province of Java (West NA, East	NA

				693,021, and central 4,296,542, Yogyakarta NA)	
Dove/pigeon	Yes	1 %	6	All province of Java (West East 921.556, East, central, and Yogyakarta NA)	Local, King, Post
Song birds	Yes	30 %	7	All district of Java	The breed of vary greatly
Wild birds	Yes	NA	6	All district of Java	The breed of vary greatly

* Significant=importance: Birds kept/exploited by more than 1 in 1000 people (based on expert opinion if no data were available)

** Score 7: More than 1 million; 6: 100,000 to 1,000,000; 5: 10,000 to 99,999; 4 1,000 to 9,990; 3: 100 to 999; 2 10 to 99; 1: 1 to 9; 0: None present in country; NA no information available

4.6 The informal poultry sector and the egg trade

Tables 8 and 9 provide some information on the scope of the informal sector for the egg and poultry trades. As there was not any consistent data available during the limited study period, the presented information is based on expert opinion.

Table 8. Informal sector related to egg sellers

Actors	Proportion of egg sellers	Numbers*	Turnover (eggs/month)	Specialisation
Producers/farmer	0.10	6	Information not available	NA
Producers/retailers	0.60	NA	Information not available	NA
Wholesalers	0.20	NA	Information not available	NA
Wholesaler/retailers	0.00	0	Information not available	NA
Retailers	0.10	NA	Information not available	NA

* Scores - 7: More than 1 million; 6: 100,000 to 1,000,000; 5: 10,000 to 99,999; 4 1,000 to 9,990; 3: 100 to 999; 2 10 to 99; 1: 1 to 9; 0: None present in country; NA no information available

Table 9. Informal sector poultry sellers

Actors	Proportion of total poultry sellers	Numbers**	Turnover (chicken/month)	Specialisation
Producers	0.50	5		NA
Producer/retailers	0.36	NA		NA
Wholesalers	0.43	NA		NA
Wholesaler/retailers	0.00	0		NA
Retailers	0.05	NA		NA

* Scores - 7: More than 1 million; 6: 100,000 to 1,000,000; 5: 10,000 to 99,999; 4 1,000 to 9,990; 3: 100 to 999; 2 10 to 99; 1: 1 to 9; 0: None present in country; NA no information available

4.7 Overview of poultry actors and their importance

Table 10 gives an overview of specific actors of the poultry sector (e.g. breeder, backyard poultry, support services and commercial sector) present in Indonesia and estimations on their total numbers for Java.

Table 10. Poultry actors present in Indonesia & estimated total numbers for Java

Breeder	No.	Backyard poultry	No.	Support services	No.
Pedigree pure lines	N/A	Chicken	7	Feed mills	7
Great grand parents		Turkey	3	Feed transport	NA
Grand parents	NA	Duck	7	Transport day old chicks	7
Parents	6/B	Moving ducks	6	Firms transporting eggs	NA
Layers	5/L	Geese	5	Transport broilers and spent layers to abattoirs	NA
Broilers	7/B	Guinea fowl	NA	Egg packing plant	5
	6 /L	Quail	7	Meat processing plant	3
		Dove/pigeon	6	Abattoirs	6
		Song birds	6	Slaughter houses Markets	NA
		Wild birds	7	Poultry vaccine producers	3
				Specialized poultry vets	1
				PDS officers	3
					3
Commercial sector	No.	Informal sector poultry sellers	No.	Informal sector egg sellers	No.
Hatchery	7	Producers	5	Producers	6
Rearing	7	Producer/retailers	NA	Producer/retailers	NA
Broiler production	7	Wholesalers	NA	Wholesalers	NA
Layer production		Wholesaler/retailers	0	Wholesaler/retailers	0
	7	Retailers	NA	Retailers	NA

* Scores - 7: More than 1 million; 6: 100,000 to 1,000,000; 5: 10,000 to 99,999; 4 1,000 to 9,990; 3: 100 to 999; 2 10 to 99; 1: 1 to 9; 0: None present in country; NA no information available

Note: B = broiler, L = layer

4.8 Vertical and horizontal integration with other actors

Table 11 is an attempt to present information on the level of integration between different actors for Java and, if any, on the level of exchange of poultry (P), information (I) and trust (T) between those actors. There are clear linkages between commercial farms, including support services. But there are no direct linkages between backyard flocks and the commercial sector.

The stability of these linkages over time in Java is described in Table 12. It is evident that the commercial sector has created stable linkages for more than 30 years.

Table 11: Vertical and horizontal integration with other actors (based on expert opinions and farm interviews)

		Commercial		Backyard		Support	Informal egg sellers		
		Rearing	Broiler	Chicken	Duck	Feed mill	Prod	Retail	Wholesales
Commercial	Rearing	P2 I3 T2 W*	P1 I1 T1 M*	NA	NA	P3 I1 T1 W*	NA	NA	NA
	Broiler	NA	P3 I1 T1 D*	NA	NA	P1 I1 T1 W*	NA	NA	NA
Backyard	Chick	NA	NA	P1 I3 T2 W*	NA	NA	NA	P2 I3 T2 W*	NA
	Duck	NA	NA	NA	P1 I2 T2 W*	NA	P1 I2 T2 W*	P3 I3 T2 W*	P2 I3 T3 W*
Support services	Feed mill	P1 I1 T1 W*	P1 I1 T1 W*	NA	NA	NA	NA	NA	NA
	Transport of DOC	NA	T1 I1 T1 35 day*	NA	NA	NA	NA	NA	NA

Matrix reads from column to row.
P: Exchange of poultry/inputs, outputs (P1=high, P2=medium P3=low)
I: Exchange of information (I1=high, I2= medium, I3= low)
T: Level of trust (T1=high, T2=medium, T3=low)
* Frequency of interaction: daily (D), weekly (W), monthly (M), never

Table 12: Stability of each actor over time and space

		Present	Numerical trend	Location	Geographic trend
Commercial	Rearing	30 years (1970^{s})	Up	Urban	Up
	Broiler	30 years (1970^{s})	Up	Urban	No change
Backyard	Chick	Always	Up	All of districts	No change
	Duck	Always	No change	All of district	No change
Support services	Feed mill	30 years	Up	Peri-urban	Up
	Transport day old chick	30 years	Up	City suburban	No change

4.9 Description of selected main actors

In this section, selected actors identified and listed in table 10 will be described in more in detail.

a) Breeder and commercial layer farms classified as sector 1 or 2

- General information
  - Typical species is chicken
  - Typical production types are broiler, layer, breeders, and hatcheries
- Housing
  - All production phases are separated, by applying the 'all in all out' principle
  - Farm building is fenced with single entry gate for vehicle and people, equipped with place for washing vehicle and with entry control.
  - Every farm building has a 'change room' which is used by all employees before entering the chicken house
  - Place for washing shoes/feet in every building
  - Window and ventilation closed with chicken wire to prevent wild birds and rodents from entering
  - Insect and rodent control program
  - Every farm building has disposal facilities for disposal dead poultry and garbage
- Bio-security
  - Staff/workers take a bath with antiseptic soap before entering the farm
  - Staff/workers are prohibited from moving from one flock to another flock
  - Vehicle for feed is cleaned and disinfected before transporting or entering/leaving the premises
  - Vehicle for feed is usually not allowed to enter the location of farm
  - Disinfection for every vehicle and goods/materials arriving
  - Disinfection & sanitation period between production cycles (Includes "all in all out," proper cleaning/disinfection & service periods etc.)
- Routine animal health practices
- Sufficient vaccination efforts against AI are being done in 100% and approximately 80% of breeding flocks and commercial layer flocks, respectively (Prajitno, 2008). Vaccination

in general is widely used in commercial poultry with a long live production cycle, such as breeders and layers

- Use of poultry health service provider
    - In house veterinary services usually based on employed private veterinarians.
    - The access to those farms for official veterinarians is, however, often very limited. Information is mainly based on company's compliance.
- Feeding

For most of the big companies, feed is obtained from own feed mill enterprise (fully integrated system). The distance of farms to their feed mill companies is around 50 – 100 km distance.

b) Kampong chicken

Kampong chicken are kept in sectors 3 and 4 (kampong=village). The production system is characterized by low or nonexistent biosecurity measures.

Vaccination against AI is applied but differs widely between different regions. The vaccination coverage remains generally low due to the high turn-over rate (expected >25% per quarter), not considering the efficiency of the vaccine used and booster regimes.

Veterinary support comes (if any) from livestock services. Detection of cases is mainly using the PDS/PDR system (see chapter Response capacity), which is currently investigated by on-going research (ILRI, 2008).

c) Poultry slaughterhouses (CSH) and slaughter places

The increased demand of ready for cook chicken meat have supported the development of Chicken Slaughter Houses (CSH, Rumah Pemotongan Ayam) for broiler, spent layers and kampong chickens. There are three categories of CSH: modern CSH, semi-modern CSH and traditional CSH. CSH is a place to process live chickens into *halal* and hygienic carcasses or chicken pieces. Modern CSH produce more hygienic and expensive chicken meat, while traditional CSH yield less hygienic and relatively cheap chicken carcasses. Traditional CSH are more competitive compared to modern CSH as the latter need a higher initial investment cost. The development of CSH is based on the population growth of broilers in line with consumer demand.

A specific religious demand of producing chicken meat or the meat of other species is that the meat must be *hallalan thoyiban*, because most Indonesians are Muslims. Based on the technical perspective of CSH, modern CSH normally have four processing rooms, namely the very dirty area, dirty area, clean area and very clean area. A Semi-modern CSH has 2 processing rooms namely the dirty area and the clean area. In this context, a modern chicken slaughterhouse is often facilitated by a number of supporting facilities, such as the cold chain mechanism, stunner, scalder, plucker, spin drum chiller, belt conveyor, blast freezer and cold storage. Modern CSH are located in some big cities, such as Jakarta, Bogor, Tangerang, Cianjur, Jogjakarta, Salatiga, and Surabaya.

Figure 2: Modern CSH in Java

Traditional CSH, also called Chicken Slaughter Places (Tempat Pemotongan Ayam), have no room classification. All steps of meat processing are conducted in a single room. All districts and sub-districts of Java have many small scale traditional CSH that are often attached to markets. The number of birds slaughtered may range from 15/day to less than 100/day. First results of an ongoing base line survey carried out in 16 Districts of Java indicate low or nonexistent biosecurity measures are applied. PPE is usually not used by any of the workers. Another critical factor is the handling of waste (e.g. thrown into the river or the use traditional dust bins).

Figure 3: Traditional CSH, some people call Chicken Slaughter Places

Commercial farms usually slaughter their poultry in chicken abattoirs. Abattoirs produce fresh, chilled and frozen carcasses. Chilled and frozen carcasses are sold in grocery store/super market, hotel, and restaurant. Fresh carcasses are sold at poultry markets, restaurant or directly to the consumer.

Markets

Markets for poultry and poultry products are a centre for economic and social activity in the community. Indonesia has more than 13,000 live bird markets operating daily, where 80% of traded poultry is sold alive and 20% slaughtered (Safe poultry Trade practices, 2007).

Poultry/live bird markets

A live bird market is a specific location where only live bird transactions take place and includes pet bird markets and poultry markets. Live bird markets are usually temporally operating markets. Their operating schedules may follow a specific religious calendar, e.g. open every 5th day. Poultry are usually traded in the early morning. Local traders move between the markets that are open on different days. Poultry are usually not separated by species (ILRI, Base Line Survey, 2008).

Biosecurity conditions are poor, there is not enough water, and there are unhygienic and/or unsanitary conditions. No personal protective equipment are used by live bird sellers. There is no disinfecting of birds, crates, pens, nor do store facilities take place (Safe poultry Trade practices, 2007).

Traditional markets (Pasar traditional)

Traditional markets are places where all commodities for daily needs, including live birds, are offered. The poultry section includes live bird selling, slaughtering and carcass selling activities with inadequate hygienic and sanitary conditions. A traditional market can be categorized as modern based on the physical aspects of the building, the trading system, and the human resources. Traditional markets are called wet markets and are characterised by unhygienic and unsanitary conditions, where there is no permanent roof (Safe poultry Trade practices, 2007). Traditional markets operate every day. Often small slaughter places are located at these markets. The number of traditional markets is much lower than the number of poultry markets.

The live bird market flow and poultry origin are presented in figures 4 and 5 (Safe poultry Trade practices in Density populated areas, 2006).

Figure 4: Flow on commercial chicken ready for slaughter

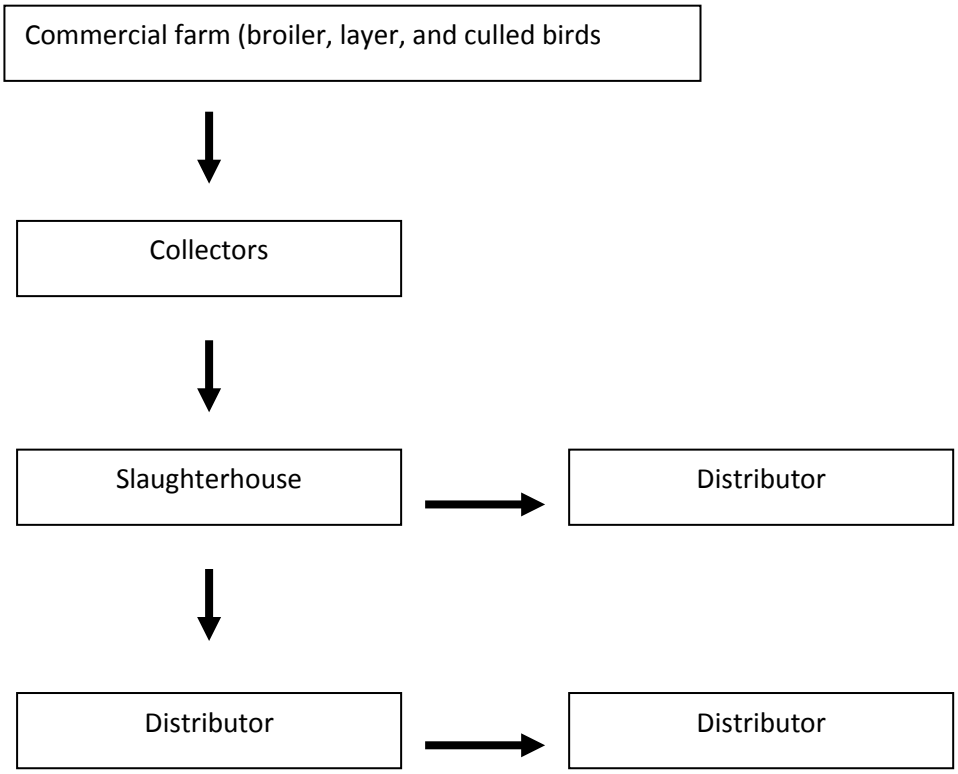
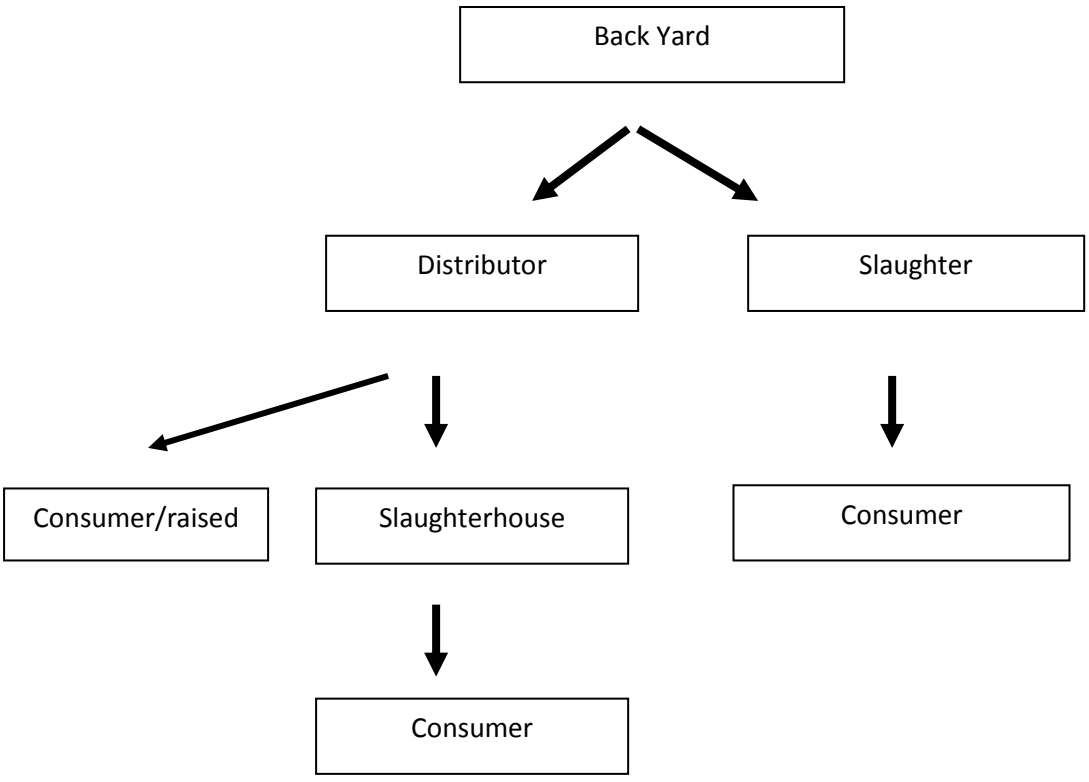


Figure 5: Flow on backyard chicken ready for slaughter



One of the main factors contributing to continued AI reports for Indonesia might be the common practices applied at markets in terms of biosecurity and almost unrestricted poultry trade. They include:

- No or very limited biosecurity measures applied
- No separation by species (ducks and chicken often kept together)
- Traders/collectors moving around in the entire sub-district or district
- Knowledge of market chains is very limited
- Origin and destination of poultry often unknown
- Sick chicken may slaughtered and sold or taken back to the place of origin for compensation
- No proper handling of solid and liquid waste
- Only limited control by Veterinary services

Initial results of on-going studies of ILRI carried out in 16 Districts of Java have also shown that sick chicken may be traded by specific traders for reduced prices (ILRI, 2008). The scope of this practice needs more investigation.

It can be concluded that even though markets were targets of recent studies, there is still a substantial lack of detailed information in terms of the current poultry trade.

5. Biosecurity, Control and Selected Risk Factors

The first outbreak of HPAI in Indonesia was in mid 2003. The disease was first found in two provinces, Central Java and Banten, and then spread rapidly to other areas in Indonesia. In the following chapter, selected biosecurity and control measures and related potential risks are briefly discussed.

Vaccination

The purpose of the vaccination is to increase poultry immunity, to protect the poultry from HPAI, to prevent and curb poultry mortality, and to reduce the virus shedding to the environment. To be successful, the vaccination should be combined with improved biosecurity, depopulation, surveillance and movement control on poultry, and poultry products. Experiences have shown that depopulation and movement control are the biggest challenges for the control of AI in Indonesia.

A great commitment of management, staff and resources is required before the vaccination can become part of a successful, sustainable campaign to eradicate HPAI in Indonesia. Vaccinations have been widely used in the large commercial sectors, but less so in other sectors. Generally, there has been a reduction in outbreaks and in the impact of HPAI on the commercial industry. For permanent success, the commercial poultry industry must become an integral part of the control program, providing information and having the opportunity to identify or modify the priorities of the control program. Some commercial farms use in-house vaccination teams or their own vets, but backyard flocks are vaccinated by the government, local vet services or trained community-based vaccinators.

Mass vaccination was introduced as one of the first responses to control the disease in poultry in 2004. The program was initially targeted in Java, as it was the region with the highest poultry population. The vaccine used was locally produced, containing a local seed virus of the H5N1 subtype (MoA, 2008). However, the vaccination on backyard poultry was not successful due to the problems of limited vaccine availability, equipment and facilities, vaccinators and the operational budget. Since 2006, the vaccination has only been implemented in 11 high risk provinces using a more targeted approach (i.e. the whole provinces in Java, Lampung, North Sumatera, West Sumatera, Bali and South Sulawesi). Criteria for prioritisation were the occurrence of human cases, high poultry density and high number of HPAI reports in poultry. The vaccination was carried out as a mass vaccination of certain populations and/or ring vaccinations around a reported outbreak (MoA, 2007). Table 13 shows the number of doses of locally produced vaccines provided by the government from 2004-2007. In addition, 47, 72 and 191 millions of vaccine dosages were imported in 2004, 2005 and 2006, respectively (H5N1 and H5N2). The homology of used vaccine isolates and field strains in 2006 ranged from 77-89%, depending on the used vaccine and field strain isolate (MoA, 2007).

Table 13: Government provision of locally produced HPAI vaccine (excluding imports) (MoA, 2008)

	Million doses	Strain
2004	132	H5N1
2005	143	H5N1
2006	103	H5N1, H5N2
2007	98.5	-

The main constraints challenging a successful vaccination program in Indonesia are (MoA, 2007):

- Veterinary authority in provinces and districts (autonomic area)
- Low vaccination coverage due to the wide areas to be covered, extensive production systems (no housing, difficulties to catch chicken etc.)
- Various species infected
- Limited human resources
- Low operational budget available

The previously applied ring vaccination around an outbreak is not a part of the current control measures any more.

When vaccinating Kampong chicken of sector 4, the high turn-over rate has to be taken into account (expected >25%). Therefore, a quarterly vaccination regime should be applied to ensure sufficient vaccination coverage, a task which might overload capacities of the country (317 million village chickens must be vaccinated quarterly). Current research studies of CMU/ILRI/FAO are targeted to a realistic and successful implementation of a mass vaccination scheme in selected provinces of Java (ILRI 2008).

It is expected that less than 40% of the standing poultry population in Indonesia is vaccinated against H5N1 avian influenza. However, the vaccination coverage should range between 60-80% in order to prevent HPAI infection and its subsequent transmission and spread in a population.

Currently, 20 different vaccines are used in Indonesia, often to an unknown extent (CMU, 2008). Their efficiency is (with few exceptions) not well proven, particularly when it comes to species other than chicken. Moreover, experiences have shown that vaccination teams can be a potential factor for spreading the virus due to inappropriate biosecurity when moving from farm to farm. However, the significance of this factor is unknown.

Vehicles, containers and catching teams used to transport birds to production units not cleaned and sanitized before and after visits.

Commercial broilers represent the largest number and the most mobile of all chicken population in Indonesia. They are rarely subject to HPAI control due to ineffectiveness of check points for transported birds to production units. In addition, the vehicles are oftentimes not cleaned and sanitized before and after visits. Government vets have often only a limited access to those farms (in particular of sector 1 and 2).

Vehicles, containers and catching teams may also spread the HPAI virus, and the level of risk is estimated to be considerably higher than that due to the movement of vaccination teams. This factor may effect in particular sector 3 (small-medium farms) and sector 4 (backyard farms).

Hatching egg (HE) collection vehicles, equipment, packaging material and staff not cleaned and sanitized before and after visits.

It particularly may affect all level of commercial farms regardless of breeding farms, large and medium operations. The level of risk cannot be determined due to lack of actual data.

The disposal of surplus males

Extra male chickens are distributed to society for the purpose of pet chickens (coloured DOC as toys for kids) and sold by some retailers at some regions of Java. In addition, a part of surplus males are also reared as meat production. It seems that this factor has a limited potency to the virus spreading. However, more specific studies are needed.

Drivers not following biosecurity procedures.

It is possible that a large number of drivers working for the chicken business do not obey standard procedures of biosecurity, which would increase the risk of the virus spreading and causing infection in new areas. More studies are needed to evaluate this factor.

Imports of Hatching eggs (HE) and DOC from other regions of Indonesia arriving in contaminated vehicles and containers.

It is possible that HE and DOCs are contaminated through vehicles and containers that have been exposed to the HPAI virus. More studies are needed.

Disposal of non-hatching eggs, un-hatched eggs and contaminated packaging materials

There is a high possibility that un-hatched eggs and contaminated packing materials will be not be disposed of properly. The level of risk cannot be defined due lack of data. More studies are needed.

Disposal of manure

Studies have shown that manure can play a considerable role in the spreading of HPAI. The virus can survive in faeces up to several weeks, depending on the temperature and humidity (Ausvetplan, Stallknecht et al. 1990; Webster et al. 1988). Disposal of manure from infected farms to uninfected areas may spread the virus to other regions. It is thought that this could be an important risk factor in Indonesia. There is strong indication that this risk applies to all levels of poultry farms. First results of ongoing studies have shown that manure is moved between Districts or Provinces (ILRI 2008) from poultry farms to be used to fertilise vegetables. There is an urgent need to gain better, reliable information on the scope of manure movement within Indonesia.

Disposal/ and handling of dead chickens

Proper handling of dead birds involves burning and burying, however, frequently farmers dispose of them directly in the environment, including throwing the dead birds into the river or the use of a ”traditional dust bin.” The latter is just a big hole in the ground that is left open and represents a

permanent source of infection for other birds or rodents. Many farmers, including commercial farms (sector 3), may dispose of dead chicken in catfish ponds. This might be a more safe way of disposal as long as these fish farms belong to the same holding. However, many farms do not have their own ponds and dead chicken are sent directly or collected by specific traders to other ponds in the neighbourhood or to more remote areas (e.g. other sub-districts). More research is needed to fully explore this factor.

The trade of dead chicken may also occur at markets (Figure 6). They are usually disposed of in the same way as described for farms or they may be sent back to the farm of origin for compensation. Initial results of on-going ILRI research carried out at chicken markets has also shown some evidence of the trading of dead chicken by specific traders for catfish ponds or small restaurants.

Figure 6: Dead chickens found at a poultry market

Handling of sick chicken

The handling of sick chicken can play an important role in the spread of the virus. The selling or slaughtering of sick chickens as soon as clinical symptoms appear seems to be a common practice for some farmers in Java. However, more research is needed to confirm this statement and to better understand the reason behind this risky behaviour.

Sick chicken are also commonly entering the poultry trade chain. First results of ongoing ILRI studies on markets in Java have shown that sick chicken are traded for a reduced price, despite the risks. Other risky practices include the return of sick poultry to the place of origin or to the collector house.

Species not separated at farm or market

Low and highly susceptible species (ducks and chicken) are often not separated at the farm or at poultry markets. This can be considered as an important risk factor for the continuous spread of AI.

Moving ducks

Around 13 million ducks are estimated to be present in Java. A proportion of these ducks may scavenge in rice fields in certain regions of the island. Districts where ducks regularly scavenge on rice paddies are: Indramayu, Brebes, Ceribon, Grobogon, Tegal, and Malang. In these regions, the duck production cycle is closely intertwined with rice cropping because the latter provides the duck feed. Most rice fields in Java produce one or two crops per year. The double rice crop areas sustain

the free grazing duck system, because they provide year-round feed in the form of post-harvest rice paddy fields.

Several researchers have discussed possible relationships between scavenging ducks and HPAI outbreaks in Asia. Gilbert, et al. (2006) showed in Thailand that there is a strong association between the number of free grazing ducks and the number of months during which second-crop rice harvest takes place, confirming that free grazing duck husbandry was strongly driven by agricultural land use and rice crop intensity. Analysis of rice cropping patterns may provide an indication of the location of populations of free grazing ducks in other countries (e.g. Indonesia) with similar duck and rice production systems. It is assumed that mixed duck and rice farming predisposes an area for HPAI persistence. In Vietnam, preliminary studies indicated links between HPAI and duck concentrations and that remote-sensing derived rice crop intensity information correlated well with free grazing duck density. This finding could be important for HPAI risk assessment in other countries where poultry statistics are only available at a limited scale (Hulse-Post et al, 2005).

Inadequate cleaning and disinfection of catching vehicles, equipment, bird containers

It is clear that any cleaning and disinfection of catching vehicles, equipment and bird containers has no guarantee to be perfect. Instead, there is a sufficiently high chance of failure due to inadequately applied standardized procedures. This aspect may affect all levels of poultry industries, but higher risk of the viral exposure will happen at commercial and backyard farms (sector 3 and 4) rather than the breeding farms of sector 1 or 2. Often, disinfection is applied without proper cleaning, a factor which clearly reduces the efficiency of disinfection.

Poor staff hygiene and lack of clean protective clothing

Bad hygiene in any poultry industry will almost always increase disease occurrence and reduce the economic benefit. Improved hygiene is usually seen in the commercial farms of sector 2 and is a less common practice on sector 3 and 4 farms.

Depopulation of more than 48 hours

The LDCC project provides active search and response teams, called PDSR teams. When HPAI occurs, PDSR teams are held responsible to handle field cases and conduct necropsy, rapid test, collect samples for confirmatory laboratory tests, follow up actions and report to the central government. One of the follow up actions is depopulation (limited focal culling of flock of origin and nearby sick birds) at case sites. This is conducted within 3 days after reporting. Problems may arise if depopulation is not carried out or is very limited due to lack of compensation. The compensation budget is potentially a problem as each district has its own policies for budgeting and autonomy. More research is needed to get information on the current compensation mechanism and alternatives that could work in Indonesia.

Different age groups of birds within a flock

The age group of a flock of birds may play an important role in disease patterns. However, HPAI occurrence does not appear to be linked to the age of the bird.

Uncontrolled marketing of poultry, lack of a disinfection policy, uncontrolled of animal movement

It is obvious that the marketing of all types of poultry is not systematically controlled. The marketing of poultry starts at the village level. Many actors are involved in these transactions, such as the farmers themselves, local buyers, collectors and wholesalers. These marketing patterns occur at the inter-village level, inter- and intra sub-districts, inter- and intra- districts and finally inter- and intra-provinces. High levels of movement of birds will increase the chance of the HPAI virus spreading. Further studies are needed to better understand the market structures and involved actors.

The government has instructed the practice of biosecurity by using disinfection. However, no standardized procedure is available for each disinfectant, dosages, levels of affectivity, rotation strategies, price list, etc. However, disinfection should always follow proper cleaning; nevertheless, this is rarely carried out.

Poultry marketing at all levels is closely linked to movement. Even though the government has a number of poultry movement control spots (check points) between provinces, it has serious limitations for the purpose of controlling HPAI as the system lacks technical veterinary procedures with regard to the practice of regulatory medicine and law enforcement. Moreover, there are many illegal ways to avoid the government official check points. First results of current ILRI studies have shown that regular checkpoints are often closed down in the visited districts (ILRI, 2008).

6. Threats and Incidences of Relevant Poultry Diseases (Excluding AI)

Some poultry threats and measures are summarized in Table 14. The three most important poultry diseases (excluding AI) are described more specifically below.

6.1 Newcastle disease

Newcastle disease is still the major problem among the poultry diseases found in Indonesia. The disease is endemic and causes high mortality, particularly in indigenous chickens. Newcastle disease is controlled by the f vaccination. The reported number of chickens infected by Newcastle disease fluctuates; there were: 201,196 cases in 2002, 324,470 in 2003 and 56,848 in 2004. However, it must be mentioned that the total figure may be much higher as the diagnostic capacity of livestock services is limited and farmers may often not report cases (in particular of sector 3 and 4).

6.2 Infectious Bursal Disease (Gumboro)

Infectious bursal disease occurs predominantly in commercial broiler and layer farms. The control program for the disease is conducted through sanitation, monitoring and surveillance as well as vaccination. Local isolates have been successfully obtained and are being used successfully to produce vaccines. The number of reported cases of infectious bursal disease was: 10,298 in 2002, 22,040 in 2003 and 1,225 in 2004.

6.3 Pullorum disease

The distribution of pullorum disease includes the provinces of Aceh, North Sumatra, Bengkulu, Lampung, East Nusa Tenggara, South Sulawesi and Southeast Sulawesi. Sporadic cases of the disease were reported in 2004, mainly in kampong chickens.

Table 14: Poultry threats and measures

	Presence	Prev.	Public contrl	Private contrl	Effective
HPAI H5N1	Yes	Endemic	Yes (see chapter 10)	Yes	No
Newcastle disease	Yes	Endemic	Yes	Yes (Vaccination in specific sectors)	?
Gumboro disease	Yes	Endemic/sporadic	Yes	Yes (Vaccination in specific sectors)	?
Poultry Campylobacter	Yes	Endemic	No	No	No
Poultry Salmonella	Yes	Endemic	Yes (Hygienic measures)	Yes (only specific sectors)	Yes

7. Occurrence of HPAI in Indonesia

7.1 Situation in poultry

Following the first outbreak of HPAI in Indonesia in 2003, 10.5 million birds were reportedly lost in 2004 due to disease and culling. The first human case of H5N1 influenza was reported in June 2005.

Avian influenza remains a large and complicated problem, influencing the overall poultry sector in Indonesia. The disease has infected poultry in 31 out of 33 provinces and in 286 out of 444 Districts all over the country. Incidences vary across the country, with lower incidences in the eastern provinces. However, the observed differences could also be a result of limited surveillance. AI is considered to be endemic in Java, Bali, Sumatra and South Sulawesi, affecting commercial and village poultry.

The core of the current surveillance for active cases is based on the Participatory Disease Surveillance (PDS), a form of surveillance that uses participatory techniques to identify cases of HPAI in poultry. PDS teams interview farmers searching for evidence of clinical outbreaks of HPAI in poultry using a clinical outbreak definition that includes sudden death and high mortality. When active outbreaks matching the case definition are present, the PDS teams carry out an Influenza A rapid test. A mortality event consistent with clinical HPAI and a positive rapid test in affected poultry is considered a confirmed detection of HPAI in areas where HPAI has previously been confirmed by laboratory testing. All data are entered into a database at the regional Local Disease Control Centres (LDCCs) and then merged nationally each week. The weekly report includes data of the recent week along with all previous data. The data are reported for three time periods: the year 2006, the year 2007, for 2008 year-to-date and for the last four weeks (see annex, table 2). It needs to be mentioned that the data presented are not representative of the overall incidences of HPAI in Indonesia, as the PDS system has spatial and temporal biases.

Table 15 presents the number of interviews, confirmed cases and the calculated detection rate for 2008 by regions based on the weekly PDSR reports (Weekly Report 20 -26 April 2008 and 27 April - 3 May 2008). The cases for 2008 were confirmed for Java (6 provinces) and Sumatera (2 provinces). The gaps for 2008 for other islands may be caused by a time lag in data entry rather than an absence of disease. The calculated detection rates vary considerably between the provinces. The sensitivity and specificity of the PDSR system is currently a topic of on-going ILRI research (see chapter 12).

Table 15: Carried out PDS interviews and confirmed cases for 2008

Island	Province	2008			Total since 2006		
		Positive	Total	Detection rate (%)	Positive	Total	Detection rate (%)
Bali	Bali	22	965	2.3	296	14804	2.0
Java	Banten	48	472	10.2	239	5982	4.0
	Central Java	7	138	5.1	708	33698	2.1
	East Java	158	5477	2.9	983	37797	2.6
	Jakarta	0	5	0.0	7	3267	0.2
	West Java	393	7558	5.2	1354	28798	4.7
	Yogyakarta	106	841	12.6	613	4145	14.8
Kalimantan	Central				3	898	0.3
	East				24	898	2.7
	South				0	1643	0.0
	West				0	1273	0.0
Sulawesi	Central Sulawesi				0	274	0.0
	Golontaro				0	671	0.0
	North S.				0	196	0.0
	South S.				4	150	2.7
	South East S.				16	220	7.3
	West S.				1	73	1.4
Sumatera	Lampung	58	650	8.9	698	9688	7.2
	North Sumatera	28	350	8.0	342	14238	2.4
		820	16456	5.0	5238	158713	3.3

A more detailed table based on all PDS reports since 2006 is attached to the annex (Table 1). Figure 2 of the annex shows the location of districts where PDS interviews were conducted for the period of April 5 – May 3, 2008 (Grey). The black dots indicate the location of the detection of HPAI during PDS interviews in this period. Figure 3 of the annex shows the same but for the period of January 2006 – May 3, 2008 (Weekly Report 20 -26 April 2008 and 27 April - 3 May 2008).

7.2 Situation of HPAI in the human population

Since the first confirmed case in 2005, Indonesia has reported 108 human deaths, 13 of them in 2008. The latest cases were observed in West Java, including urban centres. Table 16 gives an overview of human cases and deaths by year since 2005 (WHO, 2008). Figure 3 of the annex shows the location of human cases observed for 2008 for all countries, including Indonesia.

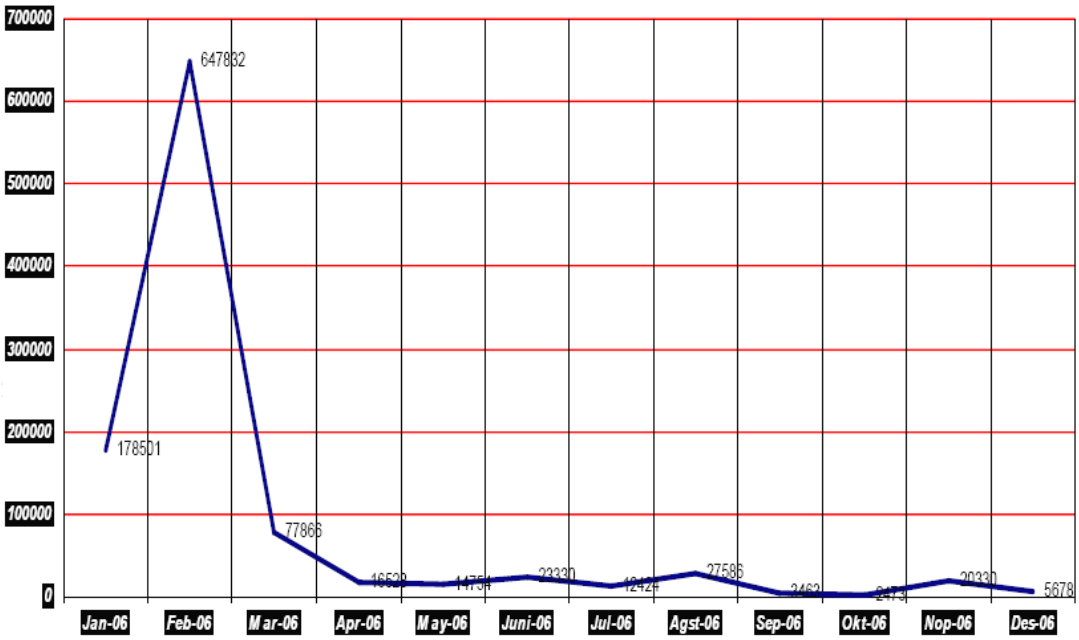
Table 16: Reported cases and deaths due to AI in Indonesia

2004		2005		2006		2007		2008		Total	
Cases	deaths	Cases	deaths	Cases	deaths	Cases	deaths	Cases	deaths	Cases	deaths
0	0	20	13	55	45	42	37	16	13	133	108

8. Economic Impacts of HPAI

Assessments of economic impacts of highly pathogenic avian influenza (HPAI) have never been easy as the impacts affect large-scale companies people at the household level and human health. As of May 2008, the number of human deaths due to or associated with avian influenza is 108 people. From August 2003 to February 2007, HPAI has spread to 31 provinces or 286 districts/cities and, by the end of 2006, had caused the death of 11.3 million chickens (see also Figure 7). The most worrying impacts of HPAI outbreaks are the declining demand of poultry products, causing the potential threats of unemployment, and decreasing quality of protein intake, especially among middle and low-income people.

Figure 7: The Death of Poultry due to Highly Pathogenic Avian Influenza (HPAI) in 2006 (Source: Directorate General of Livestock Production, 2007)



A study by Bogor Agricultural University (2007), funded by the Government of Indonesia (the Coordinating Minister of Economic Affairs), suggests that the outbreak of HPAI has reduced the export value of the poultry sector in 2004-2005. A decline of US$4.25 million of export value from the poultry sector was mostly due to a 97% decline in export volume. The average annual export volume of poultry in 2001-2003 was 228,000 tons, which then declined to only 60 tons in 2005. Exports of DOC (day-old chicken) were stopped in 2004 and 2005 because there was no demand for Indonesian DOCs from neighbouring countries. Similarly, the export value of chicken meat from Indonesia also declined by 88.21%. The only poultry product which was not affected by the outbreak was the export of duck feathers.

In the national perspective, however, the death of 11.3 million chickens due to HPAI was relatively small; 0.67% of broilers, 2.5% of layers, and 0.1 % of village chicken and ducks. In East Java, the death of broiler chicken was 2.6% from the total chicken population; in the Province of Yogyakarta, the death of broiler chicken was the highest with 10%. The death of chickens due to HPAI in the Bogor

District ranged between 5% and 14% during the period 2004-2005 (Bogor Agricultural University, 2008).

The impact of the HPAI outbreak on chicken meat consumption was only temporary, approximately 2 months after the media reports, and particularly among the low to middle income group. Interestingly, the demand on high quality chicken meat and other poultry products, which can be fulfilled by large-scale companies, has increased significantly after the outbreak, as the awareness of mid and high income consumers also increases during the outbreak period.

Fortunately, HPAI outbreaks do not have a significant impact on the national economy, as the Gross Domestic Product (GDP) from agriculture and total GDP grew at 3.4 and 5.3, respectively, in the 2004-2005 period. The outbreaks did decrease the growth of GDP in the livestock sub-sector. All other sectors, including agriculture and tourism, experienced an increase in the GDP growth rate.

In regards to the specific impact on poultry production, the AI outbreak did not reduce the performance of the poultry sub-sector, except for layer chicken. The population growth of broiler chicken, native chicken and duck have shown an annual increases since 2003, while the population growth of layer chicken still remains positive, but has slowed down. After the HPAI outbreak, the production of chicken meat increased at the rate of 25.3 % per year, a significantly high rate of growth. However, the production of layer chicken meat decreased at the rate of 17.5%, most probably because less chicken was marketed after the outbreak. The rate of egg production remained high because some large and medium-scale companies have used the modern infrastructure of egg hatchery.

The impact of the HPAI outbreaks is felt by small-scale poultry farmers who experience significant chicken deaths and the biosecurity consequences of the outbreak. Since 2005, the government has had a program of culling and compensation to mitigate the immediate impacts of outbreaks. This small farmer has to struggle to accumulate the capital for the future chains of production, so rapid cash compensation is really essential to keep these small farmers in the business. The government has spent as much as Rp 11.7 billion (about US$ 1.3 million) in 2004 for chicken depopulation and compensation, although no detailed information is available at this stage. The amount decreased to only Rp 4.1 billion (US$ 455.6 thousand) in 2006 and was estimated at about Rp 1.2 billion (US$ 133 thousand) in 2007 (DG of Livestock Production, 2007). However, so far a comprehensive economic evaluation has not been carried out about the effectiveness of such programs in terms of both reducing the burden of AI on the small farmers and creating the right incentives to encourage reporting to prevent the spread of AI.

HPAI outbreaks affect large-scale companies with modern management and sophisticated facilities. A report released by the Coordinating Minister of Economic Affairs (2007) suggests that the number of breeding farms of Pure Line companies decrease by 45.5%. The situation was similar with the breeding farms of Layer Parent Stock and Broiler Parent Stock, which decreased at the rate of 47% and 24%, respectively. However, the growth of commercial poultry companies increased significantly after the outbreaks in 2003-2004, as the demand for poultry products revived slowly but surely. Consequently, the price of chicken has increased significantly since 2005 because the increased demand for products was not met with increased poultry production. Investment in poultry business has also grown, including at the small-scale and cooperative levels, which increased at the rate of

29% and 29.5% respectively. The stock value of the poultry sector increased as well, excluding the breeding farms of Pure Line and Parent Stock.

The report also suggests that the economic impact of an AI outbreak on employment is negligible, as most livestock businesses are able to maintain their fixed labourers. These companies do not lay off daily labourers, as most large-scale and modern poultry producing companies are adopting biosecurity practices in their line of business. After the outbreak, labour absorption in the poultry sub-sector increased at a rate of 16%, due to increasing demand for poultry products. However, there is no data available on the number of self-employed people and family businesses affected by HPAI outbreaks at this stage.

Interestingly, there was no impact of AI outbreak on the tourism industry, as the total number of foreign tourists coming to Indonesia increased at the rate of 6% per year in the period of 2005 until 2006. Within the same period, the hotel occupation rate increased at about 1.9% per year. The rate before any AI outbreak was reported (2003) was 0.28% and 0.82 % during the first year of AI outbreak report. The hotel occupation rate increased at about 1.9% per year, with the rate of 0.28% before AI outbreak and 0.82% after the AI outbreak. These facts suggest that an AI outbreak does not become an important factor in shaping the tourism industry, compared, for example, to bombing threats and terrorism issues.

The most significant negative impact of the HPAI outbreak to the national economy is the profitability of small poultry farmers. Before the outbreak, the small-holder poultry farmers on an independent farm and in partnership with small farm and large-scale business (contract farm) were able to generate profits of Rp 1,665 and Rp 817 per head, respectively. After the outbreak, these small farmers experienced an economic loss of Rp 1,075 and Rp 730 per head, respectively. A study by Nugroho (2004) cited by Bogor Agricultural University (2007) also suggests that during the five cycles of production after the HPAI outbreak, small poultry farmers were able to make profits only in the first cycle, and experienced losses in the last four of the production cycles. The ranges of losses are between Rp 130 and Rp 2,077 among individual small poultry farm, and between Rp 896 and Rp 1.256 among small-holder poultry farmers under the nucleus-plasma farming system. In short, before the outbreak, the profitability level of poultry farms was Rp 1,241 per head, whereas after the outbreak, the level of loss was Rp 1.804 per head. Assuming that about 70% of poultry businesses in Indonesia are small-scale farms, the economic loss of the AI outbreak is more than Rp 1 trillion (or about US$ 1.10 million).

A more rigorous economic analysis using a computable general equilibrium (CGE) model suggests that the HPAI outbreak caused a negative significant impact on the Indonesian macro-economy (Octaviani, 2008). Three simulations have been employed: (1) a 10% decrease in productivity on poultry meat and egg, (2) a 10% decrease in four major economic sectors: poultry meat, egg, restaurant, and hotel, and (3) simulation (2) plus a demand decrease by 10% for poultry meat and egg due to a change in taste and consumption pattern (Table 17).

Table 17. Results Policy Simulation Related to AI on Macro Economic Variables

Macroeconomic Variables	Changes (%)		
	Simulation 1	Simulation 2	Simulation 3
Real GDP –expenditure side	-0.212	-0.951	-0.950
Real household consumption	0.111	-0.777	-0.784
Real investment	2.286	2.286	2.286
Export	-1.397	-1.460	-1.430
Import	1.273	1.801	1.826
Balance of trade	-0.619	-0.735	-0.728
GDP deflator	1.233	1.952	1.915
Nominal wages	1.502	1.519	1.379
Real wages	0.423	-0.576	-0.660
Price of capital	0.847	0.822	0.844
Price of land	0.186	0.119	0.054
Consumer price index	1.080	2.092	2.040

Notes:
(1) a 10 percent decrease in productivity on poultry meat and egg,
(2) a 10 percent decrease in four major economic sectors: poultry meat, egg, restaurant, and hotel, and
(3) simulation (2) plus a demand decrease by 10 percent for poultry meat and egg due to a change in taste and consumption pattern

The results show that HPAI has a negative effect on economic growth in all three simulations, as the outbreak caused higher inflation due to the declining competitiveness of Indonesian products so that the foreign reserve earnings from exports declined. Moreover, the amount of imports increased so that Indonesia would suffer from a trade-balance deficit, which in turn decreases the growth rate of the economy (Table 17). The study also suggests that HPAI has a negative impact on the performance of industrial sectors, both that have direct links and indirect links with the poultry sector (Table 17). These industries have experienced a decline in production, while the taste and consumer demand for poultry products also declined.

9. Current Policies, Laws and Legal and Regulatory Systems Related To the Poultry Sector and HPAI

Indonesia passed Law 7/1996 on Food as the National Umbrella Law for food as a basic human right for all people of Indonesia, covering the issues of production, distribution, and consumption. The law also put special emphases on food security and food safety, which are clearly stated in the Government Regulation 68/2002 on Food Security and Government Regulation 28/2004 on Food Safety, Quality and Nutrition. The regulations on food security cover: (1) food availability, from production, distribution, international trade national stock to the regional food stock system etc; (2) food accessibility, from basic access by poor family, food diversification, to food quality to fulfil basic nutrition and additional intake, and (3) food price stability, from basic staple food – mostly rice, and necessary government intervention to stabilize the price, market operation in consumer centres or big cities, and "rice for the poor", a subsidized price of rice program specifically targeted for the poor families.

The regulation on food safety, quality and nutrition covers: (1) food safety, from production, processing, transportation, supply chain including international food trading to traditional food preparation system; (2) food quality, from quality standard assurance, food distribution and retail system, food additives, and food genetically engineered or production system, food packing and packaging, irradiation, and potentially hazardous materials, contaminated food, to laboratory testing procedures; and (3) food nutrition from nutrition quality, fortification process, and communication, information, education procedures to improve the quality of nutrition. This regulation also specifically address food export-import procedures, monitoring and controlling food quality and safety, all necessary government intervention to maintain and improve food safety, quality, and nutrition.

The nature of laws and regulations related to food security and food safety are quite general and are aimed at providing broad guidelines to regulate food systems in Indonesia. Specific policies in the poultry sector, especially after the outbreak of HPAI, were developed to handle the impact of such a highly pathogenic disease on humans, to take action on the bird and poultry sectors, and to prevent further spread of the disease. After the large outbreak in 2003-2004, Indonesia passed the Presidential Regulation No. 7/006 on National Commission on Avian Influenza and Pandemic Disease and the Presidential Instruction 1/2007 on Handling and Controlling of Avian Influenza Virus. The president acknowledges the emergency nature of HPAI outbreaks and makes instructions to the Coordinating Minister of Social Welfare, Minister of Finance, Minister of Agriculture, Minister of Health, and all governors and pupates/mayors to take necessary, concrete and efficient actions to handle and control the AI outbreak. These actions are commissioned by the National Commission on Avian Influenza and Pandemic Disease and implemented by both central and local governments.

In terms of the international trade of food, the current policies refer to the standard operating procedures mentioned in the Government Regulation 28/2004, where imported food to Indonesia to be distributed across the country has to fulfil the standard of food safety, quality and nutrition, as also stipulated in other relevant laws and regulations. Imported food has also to be tested by relevant authorities in the country of origin to meet the standard of food safety, quality and nutrition; complemented by complete import documents and to be rested and verified by relevant

authorities in Indonesia before being distributed across the country. In short, individuals and/or organizations importing the food have to be responsible regarding food safety, quality and nutrition.

Similarly, for exported food from Indonesia, individuals and/or organizations exporting food to other countries have to be responsible regarding food safety, quality and nutrition. Indonesia's authorities in the fields of agriculture, fisheries, and health services, especially the agency for food and drug, have to formulate the safety and quality standards, and shall perform relevant tests in the laboratory and/or on the spot. Indonesia and its partner countries in international food trading have to agree on principles of food safety, quality and nutrition.

To improve effectiveness in the implementation of they Presidential Decree 1/2007, the National Commission formulated 6 strategic steps to handle the AI pandemic in Indonesia: (1) information, dissemination, communication, and education, mostly focused on HPAI responsive strategy; (2) restructuring the livestock industry, improvement of biosecurity, certification for commercial farms, and enforcement of poultry slaughterhouses and slaughter places; (3) integrated epidemiologic surveillance, including the expansion of participatory disease surveillance (PDS) and participatory disease response (PDR); (4) handling the virus at the source through biosecurity, vaccination, culling and compensation, including pre-cautious culling when involving human death; (5) improvement and empowerment of health services, including human vaccines and capacity building for the health service staffs; and (6) preparedness and pandemic simulation, especially in regional and local hospitals.

A more operational procedure on handling HPAI is stipulated in the regulation of Directorate General of Livestock Production in the Ministry of Agriculture, No. 45/KPTS/PD.610/F/06/06. As the price of poultry increased significantly, the above regulation was improved to become new DG regulation No. 75/KPTS/PD.610/f/10.06 to cover the compensation for poultry depopulation. The following table describes the approved compensation fund for poultry depopulation due to avian influenza in Indonesia during 2004-2007. One should note that the ideal consideration to formulate the compensation amount should include the rate of inflation, structure of production cost, and should be discussed more thoroughly with the stakeholders of the household and poultry business.

Table 18. Approved Compensation Fund Operational procedures for Poultry Depopulation

No	Fiscal Year	Number of Depopulation	Amount of Compensation (Rp)
1	2004	7,269,582	11,703,185,000
2	2005	10,778	86,250,000
3	2006	365,805	4,108,755,000
4	2007*	1,117,000	1,243,725,500

* Data in 2007 is preliminary
Source: DG of Livestock Production, 2007

According to the recently implemented Operational Research, current figures for compensation of poultry range between 2500Rp to 15000Rp. Large kampong chicken would value 15,000Rp, small kampong 7,500Rp., duck 10,000Rp., muscovy duck 10,000Rp., goose 10,000Rp., turkey 15,000Rp., productive quail 5,000Rp., and day old chicks 2,500Rp (ILRI, 2008).

10. Country-Level Organizational Structure for HPAI Management

10.1 General considerations

National Strategic Plan

The guidelines for the country-related control of HPAI in Indonesia are formulated in the National Strategic Work Plan (NSP) for the years 2006-2008. The plan was revised in 2007 and is currently under revision again. The plan has nine main components:

- Campaign Management Unit (CMU) (Organisation structure see ANNEX Figure 4)
    - The CMU consists of a main unit which is located in Jakarta and several regional units. Attached to the regional units are the Local Disease Control Centre, LDCC. The main purpose of the CMU is the coordination and lead of AI control in animals in Indonesia.
- Enhancement of HPAI Control (including vaccination)

  The key elements are:
    - Systematic vaccination of sector 3 and 4 poultry
    - Controlling outbreaks by stamping-out (including compensation) and emergency vaccination. Emergency vaccination (ring vaccination) has been replaced recently by other control measures like the fencing of birds. Moreover, as compensation is often not paid (difficulties: implementation left with Districts authorities and insufficient funds on various levels), the current culling practice is reduced to voluntary culling of the infected premise and the sick birds in the area (according to the new Standard Operating procedures, SOP).
    - Biosecurity
    - Quarantine, movement control and tracing
- Surveillance and epidemiology

  The main components are:
    - Effective early detection
    - Integrated Surveillance Information System
    - Institute a targeted surveillance program (in addition to passive surveillance)
    - Vaccination program monitoring
    - Surveillance following recognition of a human case
    - Surveillance of potential reservoirs (e.g. in situations where human health is affected a full assessment of risk factors should be undertaken with sampling of all possible animal and bird contacts)
- Diagnostic laboratory services
    - Increased laboratory capacity
    - Vaccine production and quality assurance
- Animal quarantine services (through the Establishment of National Animal Quarantine Services)
    - controls movements and tests commercial shipments of birds through 40 animal quarantine stations

- quarantine stations: e. g. Soekarno Hatta, Jakarta; Tanjung Perak; Makasar; Ngurah Rai; Tanjung Emas; Tenau; Syamsudin Noor; Sepinggan; Tarakan; Malahayati (Aceh); Tanjung Balai Asahan; Entikong; Ternate; Ambon; and Timika

- Regulation (Legislation and enforcement)
  - Strengthen the legislative base and implement an effective approach to enforcement, with particular reference to 1) the obligation of all industry sectors to report disease in a timely manner and 2) strengthening the involvement of district and provincial veterinary services in HPAI control
    Main components are:
    1. Reporting HPAI
    2. Enforcement
    3. Coordination with District and Provincial Veterinary Services
- Communication
  - Effective public relations and communication processes to ensure that all stakeholders are informed of their role and committed to support the HPAI control campaign. Some examples for information and communication activities are the published AI Bulletin, the PDSR Newsletter and HPAI Q&A Brochures (see ANNEX Figures 5-7)
- Research and development

a. Epidemiological and socio-economic factors
   - Investigate disposal practices for carcases, manure and litter from HPAI infected flocks that are culled. Evaluate associated risk factors (this may involve a pig feeding trial)
   - Establish information on bird and product marketing and movement patterns and the risk factors associated with these trading practices
   - Investigate the social and economic impact of imposing restrictions on live bird markets temporarily or permanently
   - Investigate the duration of virus shedding in vaccinated poultry as immunity wanes

b. New vaccine technologies
   - Improved methods of vaccine delivery avoiding injection (stable vaccines that may be administered in drinking water or by eye drops)
   - Investigate the use of non-viral marker vaccines for simplified application of DIVA strategies

c. Diagnostic and vaccination regimes
   - Develop rapid antigen detection tests to enable differentiation of Newcastle disease and HPAI in diseased chickens
   - A study of the NAQS contribution to the HPAI campaign should be conducted as soon as possible to ensure that this contribution is optimised
   - Vaccination of kampong chickens, magnitude and duration of the immune response generated by a single dose of vaccine
   - Establish and validate DIVA strategies to distinguish vaccinated from infected chickens

- Pathogenesis and immune response of ducks to H5N1 infection; validation of serological testing to detect infected flocks and investigation of vaccine strategies
- Studies of vaccination strategies in quail

d. Technology transfer and sharing information
- Improve participation in regional FAO/OIE diagnostic and surveillance networks
- Work in collaboration with international reference laboratories to improve timeliness in strain typing and characterisation of virus isolates

e. Information Technology
- Develop and implement improved information management and communications systems for the Ministry of Agriculture and counterpart agencies (provincial and district).

f. Role of wild birds and pigs

- Poultry Industry Restructuring
  - Limiting small scale production units to a single species
  - Strengthening sanitary procedures on farms, including on-farm slaughter and in the marketing chain

10.2 PDS/PDR system

Participatory Disease Surveillance (PDS) is an active surveillance program involving the community in detecting cases of HPAI disease in poultry in Indonesia using participatory methods. The Ministry of Agriculture cooperates with experts from FAO-UNITED NATIONS to implement this program with the support from USAID, Ausaid and Japan Trust Fund. In this program, veterinarians are especially trained to conduct early detection of HPAI and active field investigation. To follow up on every finding of a case of HPAI, the PDS team contacts the responsible PDR team, who will immediately respond with a combination of educational action, culling and controlling poultry movement (see also 7.1).

By May 3, 2008, PDS capacity was established in 14 Local Disease Control Centres (LDCCs), including 114 districts on the Island of Java, 34 on Sumatra (24 in North Sumatra and 10 in Lampung provinces) and 9 on Bali. PDSR teams have also been trained and are active in four provinces on Kalimantan and six provinces on Sulawesi. Not all districts and provinces are completely covered by PDS or PDSR activities. In total there are 615 PDS, 600 PDR and 26 PDSR teams working in the field.

10.3 Major institutional service deliveries

Indonesia has already drafted a preparedness plan and framework to prevent the occurrence of a pandemic. The National Committee on Avian Influenza Control (KOMNAS FBI) has been formed and is responsible for coordinating the implementation of the National Strategic Plan on AI Control and Influenza Pandemic Preparedness at the national and local level. The committee responds directly to the President. The committee also serves as the country's focal point for efforts of AI control at the national, regional and global level

The formulation of the NSP for Controlling AI and Preparations for Facing Human Pandemic Influenza was done in several stages. The first stage was the joint formulation by the Department of Health, the Department of Agriculture and was coordinated by the State Ministry for national Development Planning/Bappenas. The second stage was perfecting the developed plan by involving related authorities, associations, professional bodies and the private sector. In the third stage, all related authorities formulated more concrete operational plans complete with technical guidelines, which refer to this NSP. To date, the Ministry of Agriculture has had the heaviest workload, setting up surveillance of and implementing control strategies for the animal population. The Ministry of Health has also been very involved in preparing for a possible outbreak in the human population and in investigating reported deaths. Technical assistance has been found very important in strengthening these responses and in making plans for future activities.

10.4 Institutional overlaps and synergies

The Department of Agriculture and the Department of Health are technically responsible for the management and implementation, and - together with the Heads local of Governments - make functional both of these systems in all areas of the Republic of Indonesia. With the functioning of these two systems, monitoring the community, early detection and response can be done. Moreover, with the support of various institutions and related parties as spelled out in detail in the strategies, control of HPAI can be conducted. Responsibility, cooperation and togetherness in the implementation in each area and territory are the key to success in achieving the goals of the Strategic Plan. For this, Local Government Heads are the ones mainly responsible for the implementation of the Strategic Plan in their respective areas and territories.

10.5 Decentralization and responsibilities (national versus sub-national)

Since 2001, Indonesia implemented its decentralization policy as Law 22/1999 on Regional Government and Law 25/1999 Fiscal Decentralization became effective. Law 22/1999 is an attempt to democratize local government and to develop certain powers without or with minimum intervention from the central government. Law 25/1999 is designed to support that shift of power to the local government by providing more fiscal resources, or what is known as balancing financial power between central and local governments. After some years of uncertainty in terms of policy implementation, Indonesia amended both laws to become Law 32/2004 on Regional Government and Law 33/2004 on Fiscal Decentralization. Major differences between the old and new laws on decentralization are on the procedures of direct election of the Governor and Regent/ Mayor and were explained in greater detail in the new law.

In terms of authority and power, the emphasis given in the new law is that regional and local governments have more discretion to formulate and implement economic policy, including livestock and agricultural development in general. Central government continues to have the ultimate policy authority in monetary, defence, religious, and international relations. Because the scope of decentralization is very broad, the government has issued some additional operational regulations, such as Government Regulation 38/2007 on Division of Power and Responsibility between Central, Provincial and Local Government and Government Regulation 41/2007 on Organizational Structures of Local Government.

During the period of decentralization policy from 2001 to 2006, the growth of agricultural GDP revived to 3.45% per year. Except in the food sector, all three sectors of estate crops, livestock and fisheries grew at a rate above 4% per year. The food sector still grows at less than 3% per year, mostly because of poor performance of the rice sector, and other secondary food crops such as soybean, maize, and cassava (Arifin, 2007). One should notice that as the local government had more privilege and authority to formulate local level policy for sectoral and regional development, nearly a thousand new rules and regulations were passed at the local level, and were primarily local taxes and retributions on various activities of agricultural-related regional development. As a result, the level of business confidence has dropped significantly in association with increased unpredictability, weak institutional settings of the current decentralization era.

A primary reason supporting the pessimistic view about decentralization and the regional autonomy is that a greater authority to formulate local-level budget does not always translate into a better perspective of social justice. Fiscal decentralization is often interpreted as more revenue (from natural resources and local taxes), instead of more responsibilities in formulating local-level policies that can compatible for agricultural development. However, decentralization policy is argued as the most prominent way to improve the efficiency of resource allocation, promote accountability and reduce corruption within the government, and improve cost recovery. The accusation of a new strain of corruption at the local level or any other discouragements about the future outcome of decentralization is simply thought as a form of resistance posed by central-government authority or those in favour of a centralized system. In short, after decentralization, the policy norms and values, authority and responsibility, and power and obligations have changed substantially. Indonesia has to find new ways to formulate, organize and implement any policy involving regional and local governments, such as the policy on handling and controlling HPAI and its impact on the household economy and rural livelihood.

10.6 State of infrastructure and technologies for risk communication

The goals of the Indonesian HPAI risk communication are the provision of risk information, education, and communication to all layers of the community so that they are alert and they do not panic when dealing with extraordinary HPAI events, including the possibility of a human pandemic. Risk communication capabilities of a PR technician, councillors, and mass and electronic media were raised considerably in recent years.

Recent core activities of risk communication strategy include:

- Establishment of National Information Centre (NIC)
- Establishment of communication, information and education (CIE) media
- Establishment of a communication network among all partners and international institutions (WHO, FAO, OIE, etc.)
- Mass public communication (general public)
- Communication and Information to high-risk and strategic groups

11. Risk Factors/Risk Assessment

11.1 Risk assessment studies of GMU

The Faculty of Veterinary Medicine at Gadjah Mada University (GMU) has undertaken studies on risk assessment for HPAI in East Java, Central Java, and Yogyakarta Special Territory (Tabbu et al, 2006). In addition, GMU has conducted a Case-control Study on HPAI among commercial poultry smallholders in Yogyakarta Special Territory (Hananto, 2007).

The first study covers the epidemiology of AI using a Case-control and Cross-sectional study design. A total of 3,607 specimens were collected from various poultry and non-poultry. The case-control study indicated that biosecurity had little influence on the occurrence of HPAI, as only very few farmers applied the biosecurity correctly. On the contrary, environmental influence was higher, especially among wild birds (OR = 24.0) and rodents (OR = 1.9). A cross sectional study showed the role of farms in the third sector in some regions of the Yogyakarta Special Territory. If analyzed with the completely infection model for AI, the biggest association to infection of AI of poultry livestock was related to broiler farms.

The second study (case-control study) was conducted to investigate factors associated with HPAI in Yogyakarta Special Territory. Factors found to be associated with the occurrence of AI were the lack of separation of bedding treatment before being used (broiler OR = 16.4), the lack of separation between a clean and dirty area (layer and broiler OR = 8.6; layer OR = 10.0), cleanliness of the workers (layer and broiler OR = 8.1; layer OR = 5.1), the existence of wild animals around the barn (layer and broiler OR 7.8), non-all in-all out system (layer = 5.5), dirtiness of the area in the barn (layer and broiler OR 4.2), and re-use of DOC boxes (layer OR = 3.3; broiler OR =4.7).

11.2 Potential, different pathways of introduction: Wild birds

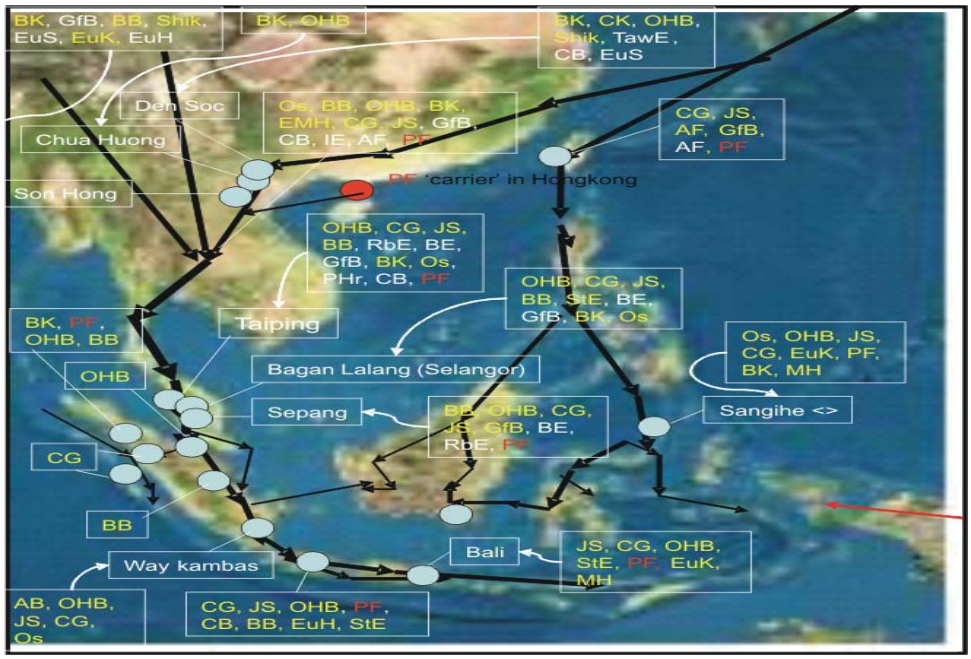
There is still little evidence that migratory birds carry and transmit HPAI H5N1. After testing hundreds of thousands of wild birds for the disease, scientists have only rarely identified live birds carrying the virus. Nearly all wild birds that have tested positive for the disease were dead and, in most cases, found near to outbreaks in domestic poultry. However, there is also clear evidence that for some countries, first introduction through infected wild birds has played an essential role in the past (e.g. Germany in 2005 and 2006), as cases in wild birds were almost exclusively followed by reports for domestic farms. But for Indonesia, wild birds may play a less important role for the spread of the virus, as many other risk factors exist.

There is no recent information for Indonesia about the prevalence of HPAI in wild birds. However, a small scale surveillance is being carried out in selected parts of the country (APAIR, 2008).

During the northern autumn season, hundreds of thousands of raptors migrate from north Asia to southeast Asia and migrate through Peninsular Malaysia. Most of the raptors are passage migrants and some over-winter in Malaysia. Some can be seen migrating over Taman Melawati Hill, Taman Melawati during the autumn and spring migration seasons. Raptors which have been seen migrating here in fairly large numbers include: Oriental Honey-buzzard (*Pernis ptilorhyncus*), Chinese Sparrowhawk (*Accipiter soloensis*), Grey-faced Buzzard (*Butastur indicus*), Japanese Sparrowhawk (*Accipiter gularis*) and Black Baza (*Aviceda leuphotes*). Other raptors recorded here include the

Rufous-bellied Eagle (*Hieraaetus kierenii*), Osprey (*Pandion haliaetus*) Common Buzzard (*Buteo buteo*) and Peregrine Falcon (*Falco peregrinus*). Some globally important raptors include the Greater Spotted Eagle (*Aquila clanga*), Short-toed Snake Eagle (*Circaetus gallicus*) and Amur Falcon (*Falco amurensis*). Some other raptor species migrate here as well, but have not been clearly identified yet (Anonymous, 2008; Hepworth et al. 2006).

Figure 8: Routes of wild birds (Hepworth et al. 2006)



A considerable migration may also occur through Central Java, originating from northern Asia and most likely passing over the Thai-Malay peninsula and Sumatra before reaching West and Central Java. An unknown proportion continues towards Bali and/or the Lesser Sunda Islands.

Analysis or genetic sequences and other indirect evidence suggest that at least in some cases, wild migratory birds are likely to have contributed to the further spread of the disease in Asia. The actual importance of this mechanism, however, is unclear in the present state of knowledge. However, it is unlikely that wild birds play a major role in spreading avian influenza in Indonesia, but more research is needed to confirm this statement.

Numerous species of wild birds, especially water birds, have been proven to be susceptible to infection by H5N1. Close contact between wild birds and poultry can lead to cross infection, from poultry to wild birds and wild birds to poultry. The conversion of wetlands to alternative uses such as farm ponds and paddy fields, brings wild birds into direct contact with chicken, duck, geese, and other domestic fowl. Additionally, species that live in and around poultry farms and human habitation could potentially transmit the virus between poultry and wild birds.

11.3 Legal imports (Country and Java)

In 2000, Indonesia imported poultry from the United States (>80% market share), Brazil (8%) and Thailand (8%). Poultry trade has been limited since the ban was implemented in 2004 on the importation of chicken meat.

During 2006, imports of poultry meat were 3,331 tons, mostly from Singapore (82%) and European countries (13%). In the same year, the Minister of Agriculture of Indonesia lifted the import ban on whole poultry carcasses and Mechanically Deboned Meat (MDM). The MDM must come from a Notifiable Avian Influenza (NAI) disease free country and originate from a farm that is registered and under the control of an authorized animal health official in the country of origin. Furthermore, the area within 50 km radius surrounding the farm must be declared free from Newcastle Disease (ND) for the last 90 days prior to the exporting date. The regulation represents a change in Indonesian policy.

Previously, the Government of Indonesia (GOI) determined that only "Safe, Healthy, Whole, and Halal (ASUH = Aman, Sehat, Utuh, and Halal)" poultry can be imported into Indonesia, so MDM did not fit under this regulation. In addition, Indonesia has banned imports of chicken leg quarter (CLQ) from the United States in 2000, claiming that CLQ do not meet the ASUH criteria because the government could not be assured that the slaughter was halal. The Indonesian poultry industry is concerned that permitting MDM imports is a precedent to allow imports of CLQ from the United States in the future. The industry claims that U.S. CLQ imports will seriously threaten the sustainability of the domestic poultry sector.

11.4 Illegal imports

Indonesia is an archipelago comprised of more than 13,000 islands, with 81,000 km of coastline and 8,000,000 km^2 of territorial waters. This represents a vast number of remote and difficult to control areas that can be easily used as entry points for smuggling. With this geographical condition, Indonesia is vulnerable to illegal imports. Indonesia has 704 formal and about 3,000 ports of entry for potential imports of goods, including livestock from other countries. Some agricultural commodities are illegally imported. Poultry producers in Medan and Riau claim that the illegal import of some livestock products have been carried for a long time and will be difficult to eliminate. They said that if the local prices of eggs and chicken meat are relatively high, then more than 60 tons of poultry per day from Malaysia will reach Sumatra (around six hours by boat) via the port of Dumai. In December 2006, one container with 5,000 duck carcasses from China was smuggled to Indonesia via Tanjung Perak port, Surabaya. At the beginning of the HPAI epidemic in Indonesia, about 4 million doses of AI vaccines were imported illegally from China in 2004.

Below is a list of important ports by air and ship for Sumatra, Java and Bali:

- Ports of entry by air
    - Sumatra: Polonia (Medan, North Sumatra), Tabing (Padang, West Sumatra), Hang Nadim (Batam Island) and St Mahmud Baharudin II (Palembang, South Sumatra)
    - Java: Halim perdana Kusuma (Jakarta), Soekarno Hatta (Jakarta), Husein Satranegara (Bandung, West Java), Adi Sumarmo (Solo, Central Java), Adi Sucipto (Yogyakarta) and Juanda (Surabaya, East Java)
    - Bali: Ngurah Rai, Denpasar.

- Ports of entry by ship:
    - Sumatra: Malahyati/Krueng Raya (Nangro Aceh Darusalam, NAD), Sabang (NAD), Lhokseumawe (NAD), Meulaboh (NAD), Sinabang (NAD), Tanjung Balai (Medan), Sibolga (Medan), Teluk Bayur (Padang), Dumai (Pelabuhan Sungai Siak, Pekan Baru), Tanjung Pinang (Tanjung Pinang), Batu Ampar (Batam Island), Sekupang (Batam Island), Tanjung Balai (Karimun), Lagoi (Panjang, Lampung)
    - Java: Tanjung Priuk (Jakarta), Cirebon (West Java), Tanjung Intan (CIlacap, Central Java), Tanjung Emas (Semarang, Central Java), Tanjung Perak (Surabaya, East Java) and Ketapang (Banyuwangi, East Java)
    - Bali: Gilimanuk (Benoa, Denpasar) and Celeuk Bawang (Celuk Bawang)

12. Previous Research and On-Going Research in Indonesia

According to the CMU, the key objectives of on-going research are as follows:

1. Improve the management, planning and capacity for HPAI control
2. Reduce the risk and improve HPAI prevention
3. Improve detection and response capacities across all sectors

According to these key objectives, various research activities have been implemented. Below is a summary of on-going and recent research and activities:

Epidemiological studies on HPAI (CMU, 2008)

- Duck vaccination studies (FAO/CIVAS, ACIAR/DIC Yogyakarta, details see ANNEX 8)
- Duck vaccination studies (FAO/South Kalimantan PLS/DIC Banjar Baru) Kalimantan duck vaccination study (FAO, Dutch MOA)
  Goal: Test a duck vaccination protocol in commercial duck farms for

  decreasing viral shedding, and thus decreasing viral transmission and maintenance of HPAI in Indonesia; study currently underway

- Vaccine testing in transmission studies (Dutch, MoA)
  Goal: quantification of the potency of vaccines to reduce virus transmission

  in a well-vaccinated population

  Results: Both H5N1 and H5N2 vaccines can reduce/prevent transmission in properly vaccinated population

- Epidemiological impact of control different control interventions (ILRI/CMU/FAO, on-going) in West Java, Central Java and Yogyakarta)
  Goal: Feasibility and impact of different control strategies (Vaccination, culling and current applied PDSR), on-going

- Identification of risk factors (FAO/WHO/MoA)
- Disease surveillance in poultry collector houses (Dutch/Jakarta PLS/CIVAS)
- HPAI: Epidemiological and economic aspect studies in different species of birds in Indonesia (DGLS/Universities/Bbalitvet)
- Cat study (FAO/DIC Yogyakarta/Bbalitvet)
- Studies on the bio security of poultry production
- Studies on bio security (planned, ACIAR/CMU)
- Epidemiological analysis of PDSR data (ILRI, FAO, on-going).
  Goal: Epidemiological pattern of AI and identification of risk factors

- Spatial risk factors analysis of humans cases of H5N1virus infections in Indonesia (FAO/CMU)
- Poultry producer profiling: Commercial producer profiling in West Java Province (FAO/CMU/PLS West Java/CREATE)
- Study of vaccination on quail and monitoring of AI subtype on swine and other mammals

- Study of AI in selected regions of East Java, Central Java and Yogyakarta (Faculty of Veterinary Medicine, GMU, resource report, 2006. Abstract see annex 1)
- Case Control Study (Faculty of Veterinary Medicine, GMU, resource report, 2007)
- Sukabumi field vaccination trial (Dutch MOA, details see Annex 9)

Economic (and Development Studies) of HPAI (CMU, 2008):

- Studies on the biosecurity of poultry production
- Commercial producer profiling in West Java Province (FAO/CMU/PLS West Java/CREATE)
- Poultry restructuring studies (planned, proposed start August 2008, Komnas/DGLS)
- Studies on biosecurity (planned, ACIAR/CMU)
- Market value chain studies (FAO/Universities, details on methodologies see Annex 10)
- Spatial risk factors analysis of humans cases of H5N1virus infections in Indonesia (FAO/CMU)
- Disease Impact assessment on household economy
- Assessing the impact of poultry market restructuring on livelihoods and gender (FAO/ICASEPS)

Social (and anthropological studies) of HPAI (CMU, 2008):

- Studies on social and cultural aspects of poultry production and consumer behaviour (FAO/CMU)
- Rehabilitation (including compensation)
- Studies on rehabilitation options (planned)
- Studies on different compensation mechanism (World Bank/KOMNAS/DGLS)
- Enhance capacity to implement HPAI prevention and control
- Legislation review at national, regional and local level
- Update legal framework relating to animal disease control especially Avian Influenza (Dutch/CMU)
- Study on risk insurance
- Communities practice appropriate behaviour to prevent HPAI dissemination and avoid human exposure to H5N1 virus
- Behaviour change communication programs (FAO/CMU; CBAIC)
- Knowledge, attitude and practice survey (USAID/AED)

13. Conclusions

13.1 Summary of main findings

Indonesia covers an area of nearly 2 million km^2. The country is characterised by highly dense areas for poultry and humans. Java is the island with the highest human and poultry density in the country.

Epidemiological section

HPAI was first reported in mid of 2003 and is considered to be endemic in many parts of Indonesia. In addition, Indonesia is the country with the highest number of fatal human cases in the world, currently with 108 confirmed cases. The most recent human cases are located in the highly populated areas of Java (e.g. West Java, Jakarta).

The Participatory Disease Surveillance (PDS) has been established successfully in many parts of the country as an active surveillance program involving the community in detecting cases of Highly Pathogenic Avian Influenza (HPAI) disease in poultry. However, it does not yet cover all regions. The AI control in Indonesia is according to the NSP, which is currently under revision.

The applied mitigation practices (including vaccination) failed to control AI and were unable to avoid the establishment of an endemic situation. The main constraints for a successful control include:

- Almost uncontrolled poultry trade in many parts of the country
- Low biosecurity at markets, slaughterhouses and farms (in particular of sector 3 and 4)
- Failure to reach appropriate vaccine coverage (in particular in sector 3 and 4). Moreover, the applied vaccination policy is not transparent and uniform (around 20 vaccines are currently used)
- Limited access of government veterinarians to the farms of sectors one or two. Therefore, the full extent of the disease in these sectors still remains unclear
- Decentralised structure of the country. Therefore, veterinary authority in provinces and districts (autonomic area)
- Other factors include the handling of dead or sick chicken (including improper disposal) and the problem of scavenging ducks

Despite various research has been carried in Indonesia since 2004 in the field of AI, the situation still remains critical also due to difficulties in implementation of research findings.

Economic section

The economic impact of the highly pathogenic avian influenza (HPAI) starts with the significant number of deaths (11.3 million chicken), as a result of the first outbreak since 2003. However, in the national perspective, the death of chicken was relatively small; only 0.67% for broiler, 2.5% on layer, and 0.1% of village chicken and/or duck. The outbreak has also reduced the export value of the poultry sector in 2004-2005 due to a significant outbreak during 2002-2003. A decline of US$ 4.25 million of export value from the poultry sector was mostly due to a 97% decline in export volume. The average export volume of the poultry export in 2001-2003 was 2.28 thousand tons, which then declined to only 60 tons in 2005. Export of DOC (day-old chicken) was stopped in 2004 and 2005 because there was no demand for Indonesian DOCs from importing neighbouring countries.

AI outbreaks have reduced the consumption of chicken meat, although only temporarily (a maximum of 2 months after being exposed by media), particularly among the low to middle income group. Interestingly, the demand for high quality chicken meat and other poultry products, which can be fulfilled by large-scale companies, has increased significantly after the outbreak, as the awareness of mid and high income consumers also increased during the outbreak period. In the macro context, the AI outbreak does not have a significant impact on the national economy, as the Gross Domestic Product (GDP) from agriculture and total GDP grow at 3.4 and 5.3, respectively, in the 2004-2005 period. The AI outbreak has some effects on the GDP growth rate of the livestock sub-sector or decreasing rate. All other sectors, including agriculture and tourism, experienced an increase in the GDP growth rate

The most significant, negative impact of the AI outbreak to the national economy is on the profitability of small poultry farmers. Before the outbreak, the small-holder poultry farmers in an individual farm and in the nucleus-plasma farm were able to generate profits of Rp 1,665 and Rp 817 per head, respectively. After the AI outbreak, these small farmers experienced an economic loss of Rp 1,075 and Rp 730 per head, respectively. Assuming that about 70% of the poultry business in Indonesia is on a small-scale farm, the economic loss of the AI outbreak is more than Rp 1 trillion (or about US$ 1.10 million) at the lower bound estimate. The AI outbreak has a negative effect on economic growth, as the outbreak has caused higher inflation. High inflation has caused the declining competitiveness of Indonesian products so that the foreign reserve earnings from exports also declined. Moreover, the amount of imports has increased, causing Indonesia to suffer from a trade-balance deficit, which in turns decreases the growth rate of the economy. The AI impacts have been even worse, as these industries have experienced a decline in production, while the taste and consumer demand for poultry products also declined.

13.2 Current knowledge gaps

According to the existing main research gaps, CMU stated in a recent presentation that a considerable amount of research has been conducted in Indonesia, especially with respect to the epidemiology of HPAI. It was further stated that:

- Results of previous studies need to be followed up
- Study results covering identified research gaps needs to be implemented
- In particular, further studies are needed to evaluate prevention and control options in Indonesia

In addition, the current lesions learned within and out of the operational research and the information, education & communication campaigns are attached to the annex (ANNEX 10). This information was presented by CMU, MoA after finalising the draft report and is therefore not included in the presented paper.

Based on the presented paper, the research gaps are as follows:

(a) Epidemiological section

General research gaps to be considered:

- Epidemiology of HPAI not yet fully understand
- Effective evidence based control measures are still lacking

More specific research gaps:

- Appropriate country adapted monitoring and surveillance schemes
- Mechanism of spread of HPAI within the country needs more research on all sectors (including specific disease spread models to support specific control measures)
- Current scope and efficiency of applied mitigation practices needs more attention
- Risk assessment (so far only applied sporadic and for specific sectors)
- Risk mapping (including remote sensing, e.g. ducks versus rice areas)
- Research on appropriate control of poultry trade (intra and inter regions)

(b) Economic section

- Perception of the importance and control of HPAI among specific stakeholders (local policy makers) needs to be more explored
- Economic evaluation of effectiveness of mitigation practices (including compensation if applied)
- Impact of regional autonomy on mitigation applied

List of References

Agriculture and Consumer Protection, 2007. Empres Transboundary Animal Diseases Bulletin. http//:www.fao.org

APAIR 2008: Personal communication.

Anonymous, 2007a. Buku Potensi Peternakan Provinsi Jawa Tengah Tahun 2007. Dinas Peternakan Provinsi Jawa Tengah, http://www.disnak.jawatengah.go.id, Ungaran, Indonesia

Anonimous, 2007b. Buku Saku Peternakan dan Kesehatan Hewan dalam Data 2007. Dinas Peternakan Propinsi Jawa Timur, www.disnak-jatim.go.id, Surabaya, Indonesia.

Anonymous, 2007c. Hasil Verifikasi & Validasi Data Peternakan. Daerah Istimewa Yogyakarta Tahun 2006. Dinas Pertanian Propinsi Daerah Istimewa Yogyakarta. E-mail: distan@pemda.diy.go.id, Yogyakarta, Indonesia

Anonymous, 2007d. Statistik 2006. Dinas Peternakan, Pemerintah Provinsi Jawa Barat. http://www.disnak.jabarprov.go.id, Bandung, Indonesia.

Anonymous, 2008. What is the Role of Wild Birds in the Spread of HPAI H5N1. Avian Influenza Task Force. http://www.aiweb.Info

Arifin, Bustanul. 2007. "Agri-Food Structure, Trade and Policies in Indonesia:

Inter-connecting Agri-Food Trade Intelligence across Asia and Latin America". Research Report submitted to the Institute for International Trade Negotiation (ICONE). Version: September 2007. Jakarta: Institute for Development of Economics and Finance (INDEF).

Association of Indonesian Livestock Experts (ISPI). 2006. "Penyusunan

Tahapan Restrukturisasi Perunggasan Indonesia" (*Stages of Poultry Industry Restructuring in Indonesia*"). Research Report submitted to the National Commission on Avian Influenza. Jakarta: ISPI.

Ausvetplan (Australian Veterinary Emergency Plan)

http://www.aahc.com.au/ausvetplan/

Bogor Agricultural University (IPB). 2007. "Koordinasi Kebijakan Penanganan

Dampak Ekonomi Wabah Flu Burung" (*Policy Coordination in Handling*

Economic Impacts of Avian Influenza"). Research Report submitted to the Coordinating Minister of Economic Affairs. Bogor: IPB

Central Agency of Statistics (BPS). 2008. Results of Population Census 1971-

2000. http://www.bps.go.id accessed on May 20, 2008.

Central Agency of Statistics (BPS). 2008. Results of National Socio-Economic

Survey: Module Consumption, 1999-2006. http://www.bps.go.id accessed on May 20, 2008.

Central Agency of Statistics (BPS). 2008. Results of National Labour Force

Survey 2001-2005. http://www.bps.go.id accessed on May 20, 2008.

Central Intelligence Agency. 2008. CIA Fact book-Indonesia.

https://www.**cia**.gov/library/publications/the-world-factbook/geos/id.html accessed on May 18, 2008.

CMU (2008): Personal communication.

Coordinating Minister of Economic Affairs. 2005. "Coordination in Handling

Economic Impacts of Avian Influenza. Summary of the Seminar. Bogor: November 28, 2007.

Marius Gilbert, Xiangming Xiao, Prasit Chaitaweesub, Wantanee Kalpravidh, Sith

Premashthira, Stephen Boles and Jan Slingenbergh (2006): Avian influenza, domestic ducks and rice agriculture in Thailand

Hananto, W., 2007. a Case-control Study of Avian Influenza among commercial

poultry smallholders in Yogyakarta Special Territory

Handoko, F. 2003. "Efisiensi Usaha Peternakan Ayam Ras Pedaging pada

Kemitraan di Parung" (Efficiency of Broiler Farm at Partnership Scheme in Parung, Bogor). Sarjana Thesis. Department of Livestock Economics, Bogor Agricultural University, Bogor.

Hepworth, R. and Lenten, B., 2006. Avian Influenza and Wild Birds. Observers of the scientific Task Force. UNEP/CMS Secretariat, Bonn, Germany. http://www.aiweb.info

Hulse-Post D.J., K.M. Sturm-Ramirez, J. Humberd, P. Seiler, E.A. Govorkova, S.

Krauss, C. Scholtissek, P. Puthavathana, C. Buranathai, T.D. Nguyen, H.T. Long, T.S.P. Naipospos, H. Chen, T.M. Ellis, Y. Guan, J.S.M. Peiris and R.G. Webster, Role of domestic ducks in the propagation and biological evolution of highly pathogenic H5N1 influenza viruses in Asia, *Proc. Natl. Acad. Sci. USA* 102 (2005), pp. 10682–10687.

ILRI, 2008: Operational Research in Indonesia for More Effective Control of Highly Pathogenic Avian Influenza. First results. (not published)

MoA, 2007: Ministry of Agriculture Republic of Indonesia, 2007. HPAI Vaccination Program in Indonesia. Scientific Conference on Vaccination, Verona, Italy

MoA, 2008: Active update and critical information on HPAI control in animals

Prepared by HPAI-CMU Directorate of Animal Health, DGLS, MoA

DFID HPAI Project-Stakeholder Workshop , 5-6 June 2008

Muladno, Sjaf, S., Arifin, A.Y., dan Iswandari, 2008. Struktur Usaha Broiler di Indonesia. PT Permata wacana lestari, Cibubur-Cileungsi, Pondok Gede.

Muladno, Sofyan Sjaf, Ahmad Yunan Arifin, and Iswandari. 2008. Struktur

Usaha Broiler di Indonesia (*Business Structure of Broiler in Indonesia*).

Jakarta: Permata Wacana Lestari. 157 pages.

National Development and Planning Agency (Bappenas). 2005. "Rencana

Strategis Nasional Pengendalian Flu Burung dan Kesiapsiagaan menghadapi Pandemi Influenza" (*National Strategic Plan in Handling Avian Influenza and Preparedness to Prevent Influenza Pandemic*). Version of December 2005. Jakarta: Bappenas.

National Commission on Avian Influenza. 2007. "Penanganan dan

Pengendalian Virus Flu Burung (*Handling and Controlling Avian Influenza Virus*). Resolution of National Meeting. Jakarta: Komnas FBPI.

OIE, 2006: www.oie.org, HPAI in poultry, country reports Indonesia

Oktaviani, Rina. 2008. "*Dampak Merebaknya Flu Burung terhadap Ekonomi*

Makro Indonesia: Suatu Pendekatan CGE" (Impact of Avian Influenza Outbreak on the Indonesian Macro Economy: A CGE Approach)". Paper presented at the Workshop on Avian

Influenza: Assessment, Policy Response, and Socio-Economic Impact, on February 28, 2008 in Sanur Bali, Indonesia.

Promed-mail (2008): http://www.promedmail.org/pls/otn/f?p=2400:1202:3807470781255482::NO::F2400_P1202_CHECK_DISPLAY,F2400_P1202_PUB_MAIL_ID:X,23487

Prajitno, T.Y, 2008. Experiences of controlling H5N1 Avian Influenza by vaccination. Japfa Comfeed Indonesia, Jakarta, Indonesia
E-mail: teguhyp@japfacomfeed.co.id

Safe poultry trade practices, 2007: Plenary & workshops on live bird and traditional markets in Indonesia. Medan, North Sumatra, march 27-29, 2007.

Safe poultry Trade practices in Density populated areas, 2006: Plenary & workshops on live bird and wet markets in Indonesia.Tangerang,18-20.9.06

Santoso, Dwi Budi, Suharyanto, and Phil Simmons. 2008. "Measuring the Economic Impact of AI of Balinese Smallholders". Paper presented at the Workshop on Avian Influenza: Assessment, Policy Response, and Socio-Economic Impact, on February 28, 2008 in Sanur Bali, Indonesia.

Simmons, Phil. 2008. "Economic and Social Impacts of Avian Influenza Outbreak in Bali and Lombok: What We Have Learned?" Paper presented at the Workshop on Avian Influenza: Assessment, Policy Response, and Socio-Economic Impact, on February 28, 2008 in Sanur Bali, Indonesia

Sims LD, Domenech J, Benigno C, Kahn S, Kamata A, Lubroth J, Martin V, Roeder P. 2005. Origin and evolution of highly pathogenic H5N1 avian influenza in Asia. Vet Rec., 157(6):159-64.

Siregar, Elly Sawitri and Darminto. 2008. Overview of Avian Influenza Research in Indonesia: Needs, On-Going Activities and Gaps. Power point presentation at the Workshop on Research Activities on Asian Influenza and TAD in Southeast Asia on January 21-22, 2008 in Bangkok, Thailand.

Stallknecht D.E., Shane S.M., Kearney M.T., Zwank P.J. (1990) Persistence of avian influenza viruses in water. Avian Dis. 34, 406-411.

Tabbu C. R. et al. 2006: Laporan Kajian AI Di Jawa Timur, Jawa Tengah dan daerah istimewa Yogyakarta. Fakultas Kedokteran Hewan, UG.,

Webster R.G. and Kawaoka Y. (1988) Avian influenza. Critical Reviews in poultry biology 1.3, 211-246

WHO, 2008: www.who.org Avian influenza situation in human.

World Bank. 2008. World Development Indicator Database, World Bank April 21, 2008. http://www.worldbank.org accessed on May 18, 2008.

World Economic Fact book. 2008. World Economic Fact book 2008. http://www.euromonitor.con/pdf/factbook.pdf accessed on May 18, 2008

ANNEX

ANNEX Abstract 1: Study of avian influenza in East Java, Central Java, and Yogyakarta Special Territory (Faculty of Veterinary Medicine, Gadjah Mada University.

So far, study of epidemiology, monitoring and concerning virus dynamics of Avian Influenza (AI) and evaluate concerning efficacy of vaccination strategy of AI in Indonesia still very limited. Despitefully, factors related to the occurrence of AI at poultry and flu bird at human are not yet checked systematically and be planned. Referring to facts, hence an integrated research in all Indonesia regions require to be conducted. This study was conducted to analyze occurrences of AI in East Java, Central Java, and Yogyakarta Special Territory.

The study covers epidemiology study (case-control and cross sectional study), serology, virus isolation, and pathology. Sample and of specimen amount to 3607, cover various poultry species and non-poultry. Study of case-control gave indication that role of bio-security had little influence to occurrence of AI. Very few farmers applying this bio-security correctly caused this. On the contrary environmental influence, especially wild bird (OR = 24.0) and rodent (OR = 1.9) very to occurrence of AI. Therefore, do human being enter in farms of third sector (OR = 2.7). Cross sectional study showed role of farms of third sector in some Yogyakarta Special Territory. If analyzed with completely infection model of AI at poultry able to be developed shall be as follows.

Logit Pr (AI=1 /x) =1 – 2.573 + 2.302 farms of layer + 2.827 farms of broiler + 1.542 Jombang Regency + 1.775 Mojokerto Regency + 2.573 Malang Regency + 0.681 Pasuruan Regency + 1.755 Klaten Regency + 1,505 Purwodadi Regency + 2,1811 Boyolali Regency + 0,7562 Layer + 2,186 Quill + 0,752 Manila duck.

Pursuant to obtained model, alternately biggest association to infection of AI at poultry livestock was farms of broiler (broiler = 1) (2.30206), followed by Malang regency (2,573), farms of layer (2.302), Quill (2.186), Boyolali Regency (2.181), Mojokerto Regency (1.775), Klaten Regency 1.755, Jombang Regency (1.542), Purwodadi Regency (1.505), Layer (0.756), Manila duck (0.752), and the smallest Pasuruan Regency (0.681).

Study of Virology showed that some of poultry populations in East Java, Central Java, and Yogyakarta Special Territory had brought antibody anti H5 virus of AI, with each detail successively for chicken 17.5 %, 24.9 %, and 31.9 %. While for poultry of non- chicken successively to third provinces was 11.2 %, 15.6 %, and 13.5 %. Antibody titre at the poultry ranged from 2^2 up to 2^4. The antibody in poultry sera of sample can be caused by effect of vaccination or infection virus of AI good and or without symptom of clinic.

Some of poultries which was positive bring antibody anti H5 AI virus in the reality still have potency to propagate virus of AI, proved the finding of AI virus with technique of RT-PCR to cloacae sample. There was virus of AI live in sample cloaca also proved with result of inoculation and of propagation AI virus at TAB. Analyze gene fragment molecular of H5 AI virus Indonesia case isolate 2005 still showed homology the highness with Indonesia case isolate 2003. Lowering of occurrence of HPAI in field in this time possibility caused by most chicken livestock especially from 1^{st} sector, 2^{nd}, and 3^{rd}, mostly have brought antibodies able to protect against attack of AI, good vaccination effect and infection natural virus.

Need further research at level of molecular to entire HA and NA gene and other internal genes to anticipate type/sub-type appearance of new AI virus mutation effect or re-assortment genetic able to cause antigenic drift or antigenic shift. Pathology study showed that clinical symptoms of AI found in field differ from symptom of AI in the early of year epidemic 2003 - 2004. Clinic manifestation of AI was covering HPAI with high mortalities and light HPAI of manifestation form.

Change of AI pathology was found at various cases in the fields based on the clinic manifestation of disease. Characterize lesion at HPAI was blooding at various organs with lesion distribution which more limited and hard degree of lesions which is lighter to be compared to change of pathologic in the early of year epidemic 2003. Clinic symptom and change of AI pathologic at broiler, kampong chicken, duck, and quill tend to less compared to specific lesion of AI found at layer.

ANNEX Table 1a-d: Specific data on commercial sector enterprises located in Java

(a). Commercial breeder

Breeds	Enterprises	Location of enterprises	Number of birds	Lifespan of birds
1. Cobb/B, Ross/B, and ISA/L,	Charoen Phokphand	Gempol, Jombang, Pasuruan, Tangerang	2.35 Millions/B 235,000/L	65-67 weeks
2. Logmann/B, Ross/B	Japfa Comfeed	Purwakarta, Pasuruan	2.00 Millions/B 200.000/L	
3. Hubbard/B, Cobb/B, Ross/B, and ISA/L	Wonokoyo	Pasuruan, Batu, Sukabumi, Serang	1,7 Millions/B 170.000/L	
4. Cobb/B, Hybro/B, and ISA/L	Anwar Sierad	Bogor, Subang, Lamongan	200.000 birds	
5. Cobb/B	Malindo	Gunung Kidul, Subang, Purwakarta, Majalengka	1.25 Millions	
6. Cobb/B	PATRIOT Panca Prima	Sukabumi, Sukorejo	45,000 birds	
7. Ross/B	Cibadak	Tangerang, Serang, Bogor, and Indramayu	190.000 birds	
8. Cobb/B, ISA/L	Reza Perkasa	Jombang	40,000 birds	
9. Cobb/B, ISA/L	BIP	Jombang, Mojokerto,Lamongan, Madiun	NA	
10. Cobb	Super Unggas Jaya	Garut, Surakarta, Sukabumi	1 Millions	
11. Cobb	Suja, Samsung	Garut, Purwakarta, Sukabumi	1 Millions	
Breeders Java (total around)			7 Millions birds	

(b). Hatcheries

Breeds	Enterprises	Location of enterprises	Number of birds	Lifespan of birds
1. ISA/L, Cobb/B, and Ross/B	Charoen Phokphand	Gempol, Jombang, Pasuruan	6,248,888/week	65-67 weeks
2. Logmann/B, Ross/B	Japfa Comfeed	Purwakarta, Pasuruan	21.3 Millions/Broiler/weeks, 1.06 Millions layers/ week	
3. Hubbard/B, Cobb/b, Ross/B, and ISA/L	Wonokoyo	Batu, Sukabumi,	1.2 Millions/week	
4. Cobb/B, Hybro, and ISA/L	Anwar Sierad	Bogor, Sidoarjo	1.2 Millions/week	
5. Cobb/B	Malindo	Gunung Kidul, Subang, Purwakarta, Majalengka	1.1 Millions/week	
6. Cobb/B	Patriot Panca Prima	Sukabumi	NA	
7. Ross/B	Cibadak	Tangerang, Serang, Bogor, and Indramayu		
8. Cobb/B, ISA/L	Reza Perkasa	Jombang	NA	
9. Cobb/B, ISA/L	BIP	Jombang, Mojokerto,Lamongan, Madiun	NA	
Hatcheries Java (total around)			25,789,616/week	

(c). Broiler

Breeds	Enterprises	Location of enterprises	Number of birds	Lifespan of birds
1. CP 707	CP Jaya Farm	Gempol, Jombang, Pasuruan	8.0 Millions/week	35 days
2. Logman and Ross	Japfa Comfeed	Purwakarta, Pasuruan	6.0 Millions/week	
3. Cobb, Hybro, Ross	Anwar Sierad	Lamongan, Bogor, Subang	1.0 Millions/week	
4. Cobb	Patriot Panca Prima	Pasuruan, Sukabumi	0.59 Millions/week	
5. Cobb	Reza Perkasa	Ploso, Jombang	0.80 Millions/week.	
6. Cobb	Malindo	Bogor, Subang	0.80 Millions/week	
7. Cobb, Ross	Wonokoyo	Sukabumi, Serang	0.25 Millions/week	
8. Cobb	Suja, Samsung	Garut, Purwakarta, Sukabumi	0.3 Millions/week	
9. Ross	Cibadak	Tangerang, Serang,Bogor, dan Indramayu	1.0 Millions/week	
Broiler, Java (total around)			16.5 Millions/week	

(d) Layers

Breeds	Enterprises	Location of enterprises	Number of birds	Lifespan of birds
1. CP 909	CP Jaya Farm	Gempol, Jombang, Pasuruan	1.3 Millions/week	80 weeks
2. ISA	Durian	Wonosalam	4,000/week	
3. ISA	Japfa Comfeed	Purwakarta, Sidoarjo, Pasuruan	1.2 Millions/week	
4. ISA Brown	Anwar Sierad	Lamongan	100,000/week	
5. ISA Brown	Patriot Panca Prima	Sukabumi	1 Millions/week	
6. Cobb	Malindo	Wonosari	50,000/week	
Layers Java (total around)			4.5 Millions/week	

ANNEX Table 2: The number of PDS interviews and the outcome of the interviews for the period 5 April – 3 May 2008, from 2006 up to 3 May 2008

Table 1: PDS activities by province. The number of PDS interviews and the outcome of the interviews are shown for the period 5 April – 3 May 2008, the year 2008 to 3 May 2008, the whole year of 2007 and the whole year of 2006. Detection rates are shown per time period and per province.

			5 Apr - 3 May 2008 Interviews b)			2008 Year-to-date Interviews			2007 Interviews			2006 Interviews			Program-to-Date Interviews	
Island	Province	Number of District	Positive	Total	Detection Rate	Positive	Total	Detection Rate	Positive	Total	Detection Rate	Positive	Total	Detection Rate	Total	Detection Rate
Bali	Bali	9	0	700	0.0%	1	3,414	0.0%	275	10,425	2.6%	22	965	2.3%	14,804	2.0%
Java	Banten	6	4	256	1.6%	50	1,391	3.6%	141	4,119	3.4%	48	472	10.2%	5,982	4.0%
	Central Java	35	0	0	-	249	9,140	2.7%	453	24,420	1.9%	7	138	5.1%	33,698	2.1%
	East Java	38	1	802	0.1%	11	7,786	0.1%	806	24,534	3.3%	158	5,477	2.9%	37,797	2.6%
	Jakarta	5	0	184	0.0%	4	1,005	0.4%	1	2,257	0.0%	0	5	0.0%	3,267	0.2%
	West Java	25	9	212	4.2%	311	4,197	7.4%	657	17,043	3.9%	393	7,558	5.2%	28,798	4.7%
	Yogyakarta	5	0	0	-	85	531	16.0%	423	2,773	15.3%	106	841	12.6%	4,145	14.8%
Kalimantan	Central Kalimantan	4	0	18	0.0%	0	157	0.0%	3	741	0.4%				898	0.3%
	East Kalimantan	5	0	15	0.0%	0	304	0.0%	24	594	4.0%				898	2.7%
	South Kalimantan	3	0	12	0.0%	0	287	0.0%	0	1,356	0.0%				1,643	0.0%
	West Kalimantan	12	0	27	0.0%	0	307	0.0%	0	966	0.0%				1,273	0.0%
Sulawesi	Central Sulawesi	1	0	0	-	0	24	0.0%	0	250	0.0%				274	0.0%
	Gorontalo	4	0	0	-	0	30	0.0%	0	641	0.0%				671	0.0%
	North Sulawesi	4	0	0	-	0	27	0.0%	0	169	0.0%				196	0.0%
	South Sulawesi	4	0	0	-	0	0	-	4	150	2.7%				150	2.7%
	Southeast Sulawesi	6	0	0	-	0	0	-	16	220	7.3%				220	7.3%
	West Sulawesi	1	0	0	-	0	0	-	1	73	1.4%				73	1.4%
Sumatera	Lampung	10	41	423	9.7%	312	2,213	14.1%	324	6,825	4.7%	58	650	8.9%	9,688	7.2%
	North Sumatera	24	0	59	0.0%	51	3,170	1.6%	263	10,718	2.5%	28	350	8.0%	14,238	2.4%
Total/Average		201	55	2,708	2.0%	1,074	33,983	3.2%	3,391	108,274	3.1%	820	16,456	5.0%	158,713	3.3% a)

a) This value is the percentage of total positive cases up to 3 May 2008 out of the total number of interviews up to that date.

b) Please note that the total number of interviews and positive cases started to reduce in all provinces during this period, since we started to move into the new PDSR system on 1 April 2008. We are going to continue reporting the weekly interviews and positive results in this format until all data in the old database has been completely entered and analyzed.

The new database which is based on village as the epidemiology unit is kept separately from the present database and will be reported in a new version of weekly report when the data is available for analysis.

Annex Figure 1: Location of districts where PDS interviews were conducted (grey) and detection (black) of HPAI during these interviews (5.04.08 – 3.05.08)

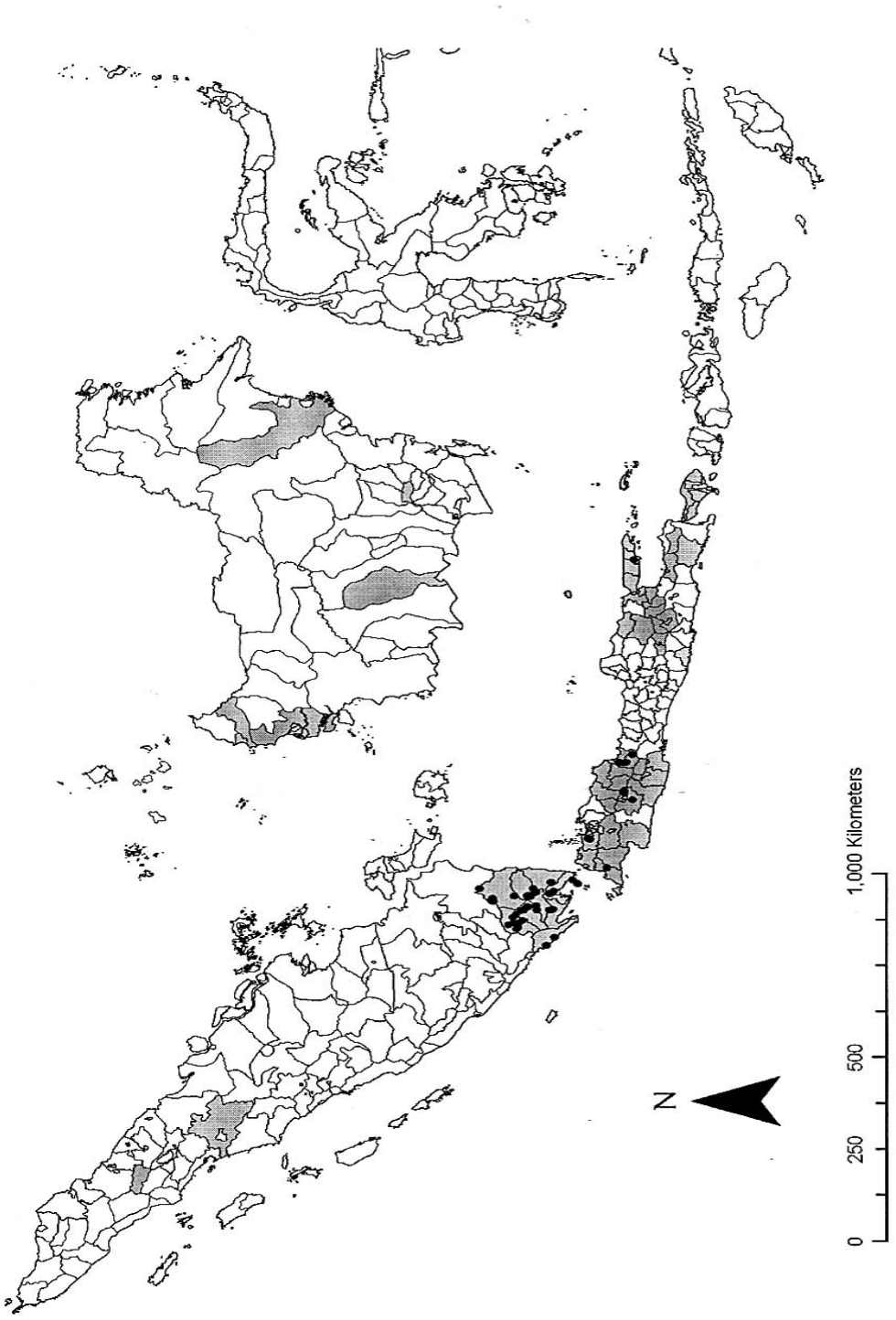


Figure 1: Map showing the location of districts where PDS interviews were conducted in the period 5 April – 3 May 2008 (Grey). The black dots indicate the location of the detection of HPAI during PDS interviews in the period 5 April – 3 May 2008.

ANNEX Figure 2: Location of districts where PDS interviews were conducted (grey) and detection (black) of HPAI during these interviews (2006 – 03.05.08)

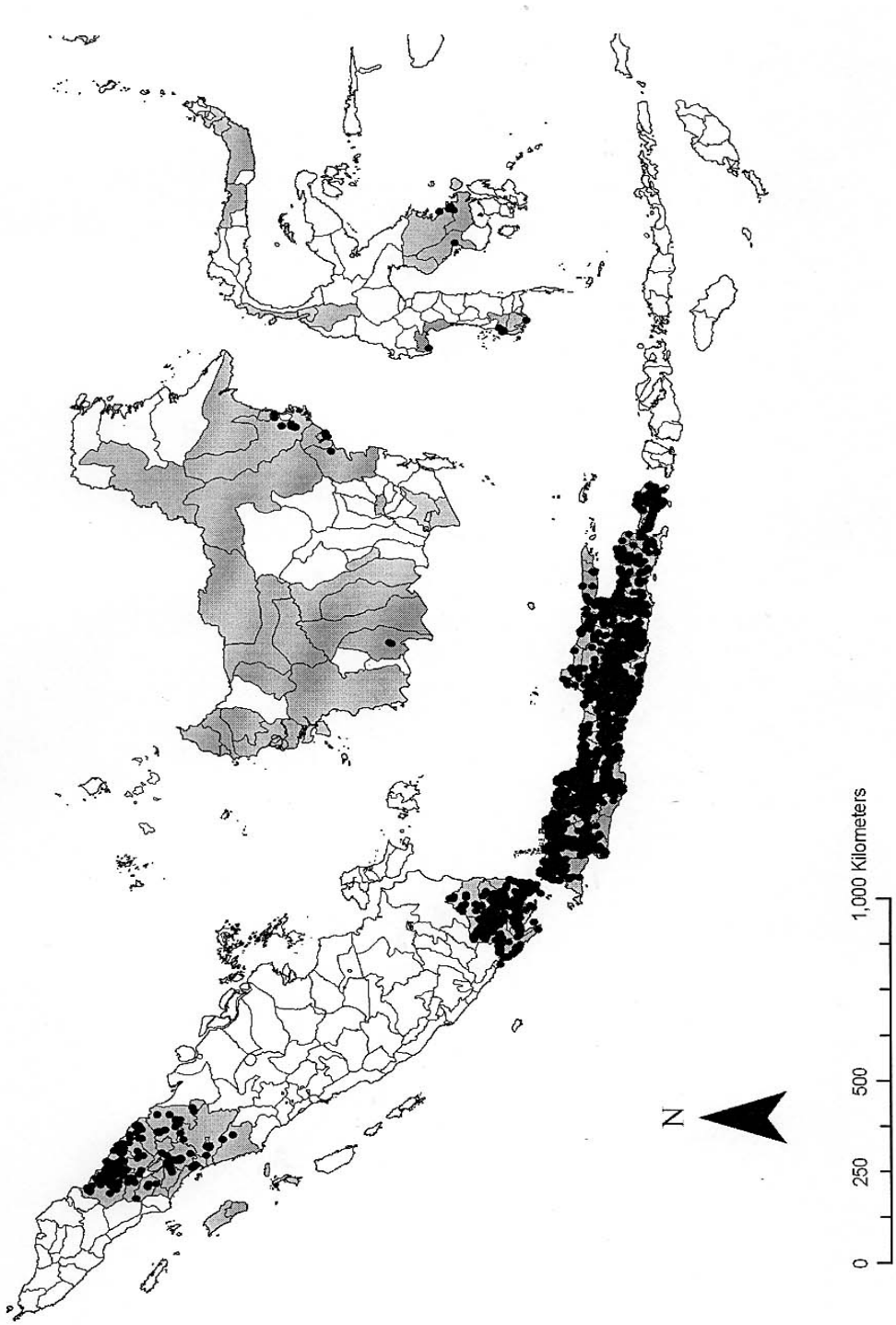
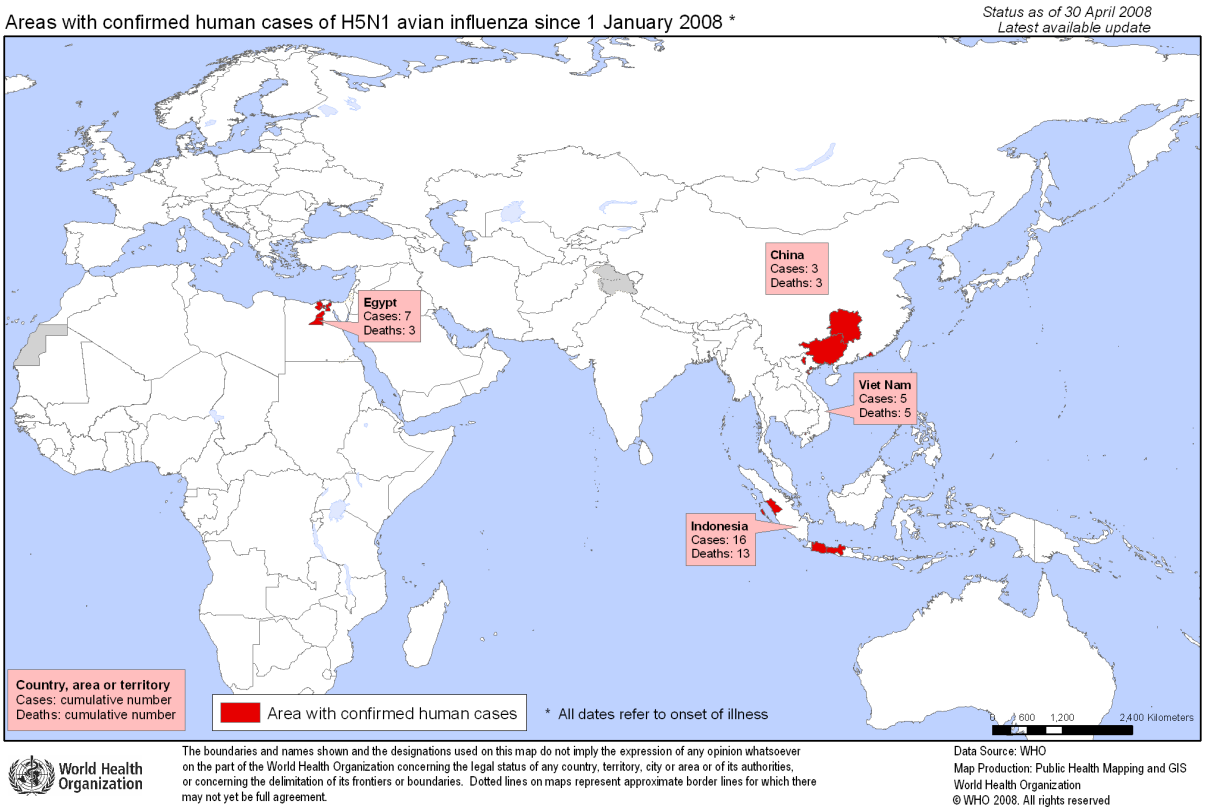
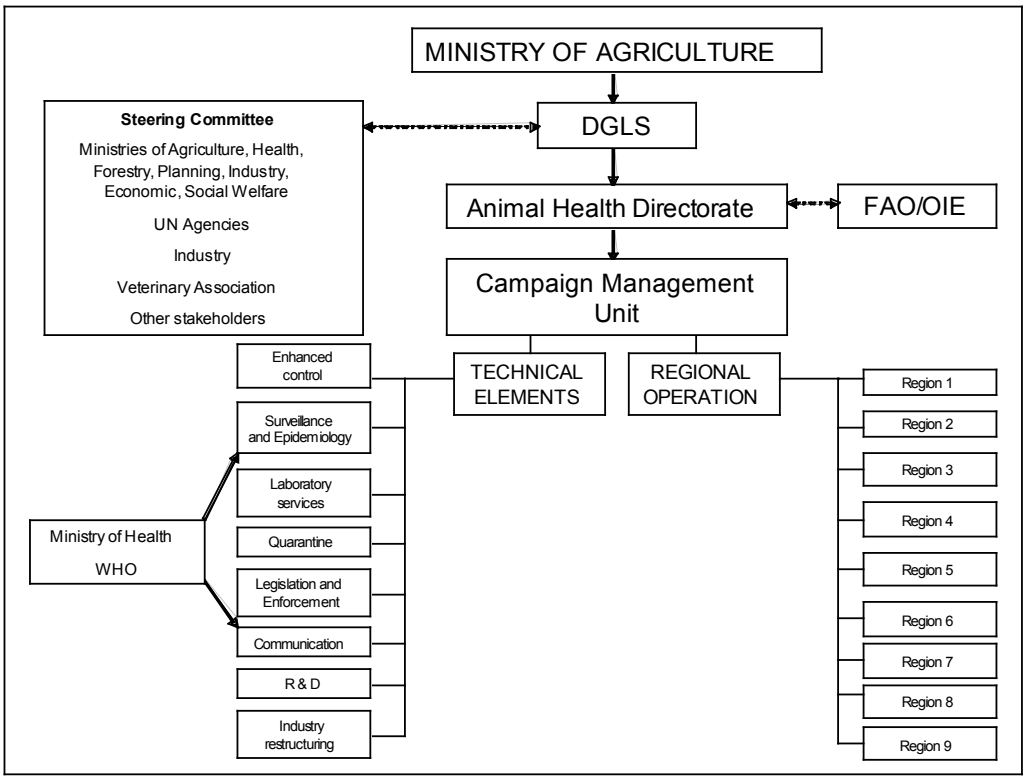


Figure 2: Map showing the location of districts where PDS interviews were conducted from 1 January 2006 – 3 May 2008 (Grey). The black dots indicate the location of the detection of HPAI during PDS interviews in the period 1 January 2006 – 3 May 2008.

ANNEX Figure 3: Occurrence of human cases for HPAI H5N1 in 2008



ANNEX Figure 4: Organisation structure of the CMU

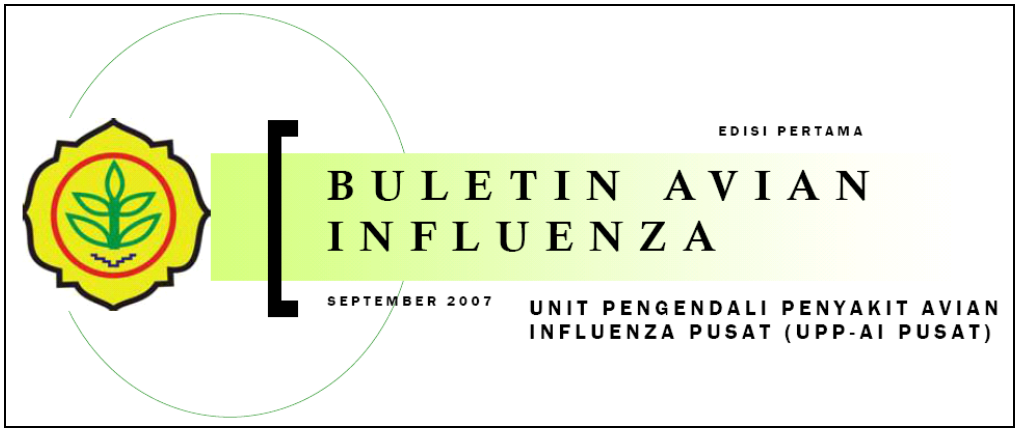


ANNEX Table 3: Regions Applying for Compensation of Poultry Depopulation

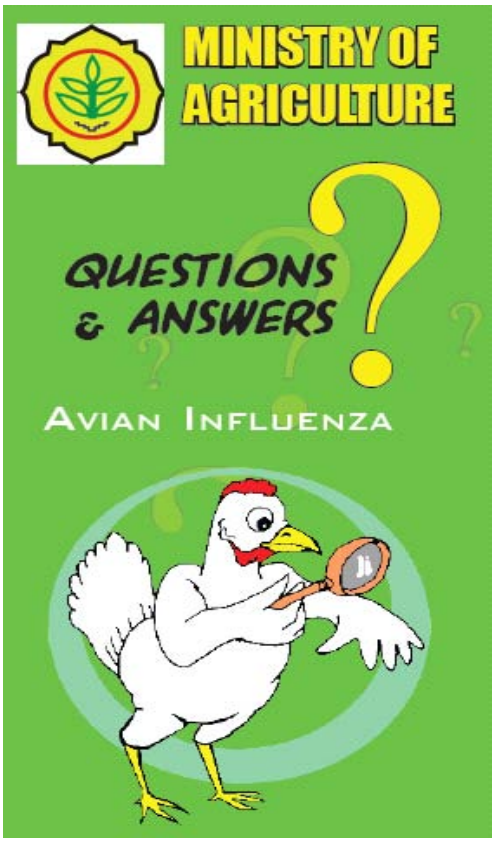
No.	Province	District/City	Compensation Fund (Rp)	Operational Fund (Rp)
1	Sumatra Utara	Mandailing Natal	99.705.000	6.587.000
2	Sumatra Barat	Solok	7.475.000	598.000
3		Tanah Datar	53.487.500	4.279.000
4		Pesisir Selatan	268.328.000	32.024.000
5	Riau Kepulauan	Batam	21.262.5000	1.701.000
6	Lampung	Lampung Selatan	10.952.500	887.000
7	Banten	Tangerang	5.950.000	440.000
8		Serang	4.790.000	320.000
9	DKI Jakarta	Jakarta Barat	14.462.500	1.157.000
10		Jakarta Utara	10.175.000	2.035.000
11	Jawa Barat	Sumedang	31.287.500	2.503.000
12			11.025.000	882.000
13		Bekasi	69.400.000	5.261.000
14			11.635.000	801.000
15		Sukabumi	9.537.500	763.000
16		Kuningan	84.290.000	5.885.000
17		Bandung	2.087.500	167.000
18		Garut	95.865.000	7.026.000
19	Jawa Tengah	Sukoharjo	4.737.500	379.000
20		Klaten	93.350.000	18.670.000
21		Demak	69.819.000	13.647.000
22	Sulawesi Selatan	Soppeng	108.300.000	7.220.000
23		Maros	7.575.000	505.000
24		Gowa	36.525.000	2.435.000
25	Jawa Timur	Bangkalan	625.000	
26		Ponorogo	5.712.000	457.000
27		Kediri	52.500.000	10.500.000
28		Madiun	34.782.000	5.086.000
29		Mojokerto	48.495.000	3.233.000
30		Bojonegoro	7.935.000	873.000
31		Banyuwangi	1.447.500	159.000
32	Bali	Tabanan	9.362.000	1.036.000
33		Jembrana	23.820.000	382.000
	Indonesia Total		**1.296.702.000**	**137.598.000**

Source: DG Livestock Production, 2008

ANNEX Figure 5: Information and communication, examples (MoA, 2008)



ANNEX Figure 6: Information and communication, examples (MoA, 2008)



ANNEX Figure 7: Information and communication, examples (MoA, 2008)

PDSR NEWSLETTER

THE 4TH EDITION/DECEMBER 2007

Table of Content

FROM THE EDITOR

New Year, New Form

Welcome to the fourth edition of PDSR Newsletter in the beginning of year 2008. It's been three and a half years since we are working together in Avian Influenza disease control, but we have not seen the concrete result yet. It happens because the number of infected districts/cities is increasing from time to time although there is a decrease in number of mortality. What is this phenomenon about? It needs more laboratory and epidemiology researches. In facing this situation, we need to sharpen and improve the efficiency of work and task of PDS and PDR by changing its name to PDSR.

ANNEX 8: Duck vaccination studies (MoA, 2008)

- **Sukabumi field vaccination trial (Dutch MOA)**
  - Goal: To learn lessons at pilot level on vaccination effectiveness, vaccination strategies, and development of bio-security methods
  - Key activities: pilot testing of vaccination strategies -- vaccination of poultry farms and village chicken in adjacent zones, sampling, monitoring & surveillance
  - Results:
  - Layer farms: >70 % protection; Native broilers: > 60 % protection; Village chicken: > 20 – 50 % protection
  - Village vaccination campaigns need good preparation
  - Sentinels are effective for DIVA but not easily accepted by farmers
  - Bio-security is poor and not easy to improve
  - Vaccine efficacy cannot be demonstrated (yet)
  - Good collaboration of all participants / stakeholders (CIVAS, Dinas Peternakan, farmers, laboratories)
  - Need for quality assurance programmes in laboratories
- **Vaccine testing in transmission studies (Dutch MOA)**
  - Goal: quantification of the potency of vaccines to reduce virus transmission in a well-vaccinated population
  - Results: Both H5N1 and H5N2 vaccines can reduce/prevent transmission in properly vaccinated population
- **Kalimantan duck vaccination study (FAO, Dutch MOA)**
  - Goal: Test a duck vaccination protocol in commercial duck farms for decreasing viral shedding, and thus decreasing viral transmission and maintenance of HPAI in Indonesia
  - Study currently underway

ANNEX 9: Sukabumi field vaccination trial (Dutch MOA, details see Annex 9)

Goal: To learn lessons at pilot level on vaccination effectiveness, vaccination strategies, and development of bio-security methods

Key activities: pilot testing of vaccination strategies -- vaccination of poultry farms and village chicken in adjacent zones, sampling, monitoring & surveillance

Results: Layer farms: >70 % protection; Native broilers: > 60 % protection; Village chicken: > 20 – 50 % protection

ANNEX 10: Market Value chain studies, methodologies

- Study parameters set through preliminary workshop with stakeholders identified market chains, focus districts, key 'actors'.
- University of North Sumatra contracted to conduct market chain survey (470 respondents in 13 districts using 26 enumerators)
- Study methodology presented to provincial and district livestock officers at workshop
- 8 market chains analyzed (broilers, layers, Kampung chicken, Duck, Quail, Pet birds, Feed, Manure)
- Results presented to provincial and district livestock officers at workshop
- Advisory group established (FAO, regional livestock services) to oversee and advise study implementation

ANNEX 11: Lessons learned, HPAI control in animals in Indonesia (MoA, 2008)

Related to operational research

- Genuine interest at district/local level in improving the HPAI control programme
- Coordination of activities at all levels is essential and time consuming
- Vaccination preparations very useful – improved understanding of cold chain requirements, training material for community vaccinators and their supervisors
- Compensation – development of robust and efficient mechanism not easy

Related to information, education and communication

- Difficult to diagnose HPAI in poultry on clinical signs alone
- High poultry mortality is common, especially in sectors 3 and 4
- Many producers and traders still not clear about the difference between HPAI and other killer diseases of poultry, e.g. Newcastle disease
- Many poultry workers and traders believe that H5N1 is not a problem for them but rather that the disease more frequently affects people who interact with poultry infrequently
- Salvage strategies employed by owners based on short-term financial/livelihood objectives
- Most animal health professionals and communication specialists have little knowledge about poultry and their owners