

Final Report

*Avian Influenza Virus Detection
in the Environment and Poultry Coming
to Poultry Collecting Facilities (PCFs)
in DKI Jakarta*

2009 - 2010

Indonesian Dutch Partnership Program on Highly Pathogenic Avian Influenza Control

Ministry of Agriculture, Republic of Indonesia

Marine and Agriculture Service Office of DKI Jakarta Province

Center for Indonesian Veterinary Analytical Studies



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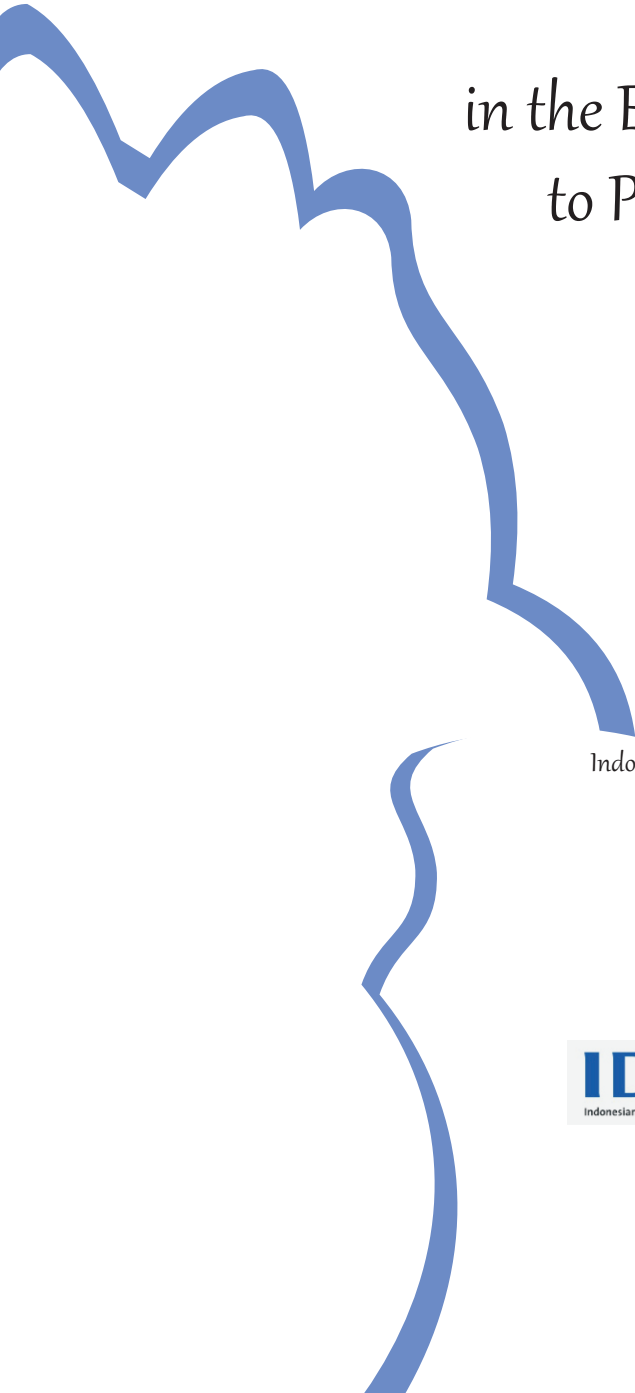
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SUMMARY

Highly Pathogenic Avian Influenza (HPAI) remains a disease with important economic and public health implications in Indonesia. In 2007, the Centre for Indonesian Veterinary Analytical Studies (CIVAS), in collaboration with the Marine and Agriculture Service Office of DKI Jakarta Province and Indonesian-Dutch Partnership on HPAI Control in Indonesia, conducted a HPAI surveillance study in poultry collecting facilities (PCFs) in five municipalities in DKI Jakarta. This study, utilizing sentinel chickens, demonstrated that HPAI virus could be detected in a high proportion of PCFs. A subsequent study in 2008, identified HPAI virus both in the PCF environment as in the arriving poultry consignments. The present study was a continuation of these surveillance activities and had as objective to measure the occurrence of HPAI in incoming poultry batches and in the PCF environment.

The study was conducted for 11 months and was divided into four sampling periods and one period in which sentinel chickens were placed in the PCFs. Fourty PCFs located in five municipalities in DKI Jakarta Province participated in the study. Samples which were taken during the sampling periods consisted of tracheal swab samples from arriving poultry batches, swab samples from the PCF environment and blood samples from spent layer and parent stock batches. During the sentinel period, tracheal swab samples were collected from dead sentinels and from those sentinels that were still alive at the end of the monitoring period. Swab samples from incoming poultry batches and from the PCF environment were combined into pools of five swabs each; swab samples from sentinels were tested individually. Pooled swab samples were screened with a matrix (M)-PCR; all positive samples were then tested with an H5 PCR. Serum samples were analyzed with the haemagglutination inhibition (HI) test for the presence of antibodies against H5. Additional data was collected using questionnaires and biosecurity checklists.

HPAI virus was detected in 3.2% of the poultry batches delivered to PCFs. The number of HPAI infected poultry batches was significantly higher during the last two sampling periods which coincided with the rainy season in Indonesia. Thirty-four percent of the total number of HPAI infected batches were native chickens and 18.3% of all native chicken consignments were infected. PCFs receiving an infected poultry batch were five times more likely to have a HPAI positive environmental sample taken during that same week compared to PCFs which did not receive an infected poultry batch. HPAI positive environmental samples were found in 30% of the PCFs during the four sampling periods. In contrast, based on HPAI detection in sentinel chickens, 77.5% of the PCFs had evidence of the presence of HPAI virus during a three week monitoring period.

The results of this study suggest that PCFs may play an important role in human HPAI exposure and in sustaining HPAI infection cycles between poultry flocks. This type of surveillance can be used to detect HPAI outbreaks in the field, identify important geographical areas of HPAI occurrence and pinpoint high-risk PCFs. Ultimately it should be used to inform targeted intervention strategies.



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CIVAS would also like to thank the Animal Health Director of the Animal Health Directorate in the Directorate General of Livestock Services - Ministry of Agriculture, UPP-AI Coordinator - Ministry of Agriculture, Head of the Marine and Agriculture Service Office of DKI Jakarta Province, and Head of the Livestock, Fishery, and Marine Service Office of five municipalities in DKI Jakarta and staff, and Head of the Fish and Animal Health Agency of DKI Jakarta Province and staff for the cooperation, discussion, and advice for the study.

Thank you to CIVAS field team for the discipline and hard work, hence the surveillance study could go well. CIVAS would also like to thank all Poultry Collecting Facility owners and workers who have participated in this study.

Hopefully the results from this study can be used for the improvement of animal health and public welfare, and the advancement of Indonesia.



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I. INTRODUCTION

1.1. Background

Highly Pathogenic Avian Influenza (HPAI), caused by a H5N1 subtype of the Influenza A virus, is of global concern because of its perceived potential to bring about a human influenza pandemic (Rezza, 2004; Trampuz et al., 2004; Katz et al., 2009). The zoonotic nature of this disease was first demonstrated in 1997 during outbreaks of H5N1 in poultry in Hong Kong. During this epidemic, 18 people were infected resulting in 6 fatalities (WHO 2006). In 2003, human cases of H5N1 occurred again in Hong Kong and again poultry was believed to be the source of infection (WHO 2006).

In November 2003, HPAI in poultry was officially reported for the first time in Indonesia (OIE 2004). As of June 2011, Indonesia has reported 178 human H5N1 cases with 146 fatalities (WHO 2011). With this, Indonesia has the highest human mortality due to H5N1 with a Case Fatality Rate of 82%.

DKI Jakarta as Indonesia's capital is home to 8.5 million people (Citizenship and Civil Documentation Office of DKI Jakarta 2010). It is a densely populated city with very high needs for poultry. This is reflected in the amount of chickens imported to DKI Jakarta, which is estimated to be around 600,000 birds per day (Pemprov DKI Jakarta 2008). Poultry is transported into the city mostly as live birds. For logistical reasons poultry is temporarily kept at poultry collecting facilities (PCFs) spread throughout DKI Jakarta before finally sold in markets to consumers, either alive or as carcasses.

Several studies have demonstrated that live bird markets play an important role in the disease transmission between poultry and it has been suggested that those markets could play a role in human infections with HPAI (Bridges et al., 2000; Senne et al., 2003). Therefore, in 2007, CIVAS in collaboration with the Livestock, Fishery, and Marine Service Office of DKI Jakarta and the Indonesian-Dutch Partnership on HPAI Control (IDP-HPAI) conducted a surveillance study in 40 PCFs in five municipalities in DKI Jakarta using a sentinel approach. Seven to eight sentinel chickens were placed in each PCF, for a total of 304 sentinels of which 243 birds died during the three months surveillance period. Based on the detection of H5 antigen with the RT-PCR test, it was found that 84% of the PCFs had one or more dead sentinel birds infected with HPAI.

Unfortunately, this study could not identify the source of HPAI viruses in the PCFs or answer the question whether the virus was circulating in the PCFs or was frequently introduced by new batches of infected poultry. In order to determine the frequency of introduction of HPAI virus in PCFs in DKI Jakarta and to trace the farms and regions of origin of these viruses, a surveillance study was initiated in 2008 in which incoming poultry consignments to 12 PCFs were monitored for the presence of HPAI (CIVAS, 2009). The present study is a continuation of that study over a longer period of time with similar objectives but with a modified study population, study design and sampling scheme.



1.2. Objectives

More specifically, the study has the following objectives: (1) to detect the presence of HPAI virus in poultry arriving at PCFs, and within the environment of PCFs, (2) to determine the HPAI infection frequency of poultry transports arriving at the PCFs, (3) to determine the serological status of spent layers and parent stock arriving at the PCFs, (4) to trace the farm and region of the birds that are infected by HPAI which arrive at the PCFs, (5) to investigate any seasonal fluctuations in the occurrence of HPAI infections in poultry transports, and (6) to determine the biosecurity practices in PCFs and during transport.



II. METHODS

2.1. Time

The study was conducted during a period of 11 months, starting in April 2009 until March 2010. This study period was divided into 4 sampling periods in which samples from incoming poultry batches and from the PCF environment were collected. In between the second and the third sampling period, sentinel chickens were placed in each PCF and monitored for a period of three weeks, or less if all sentinels had died before the end of the monitoring period. The calendar dates of the sampling periods and sentinel period are listed in Table 1.

Table 1. Sampling Periods and Sentinel Monitoring Period During HPAI Surveillance of PCFs in DKI Jakarta

Sampling Period	Time Period	Activity
I	27 April – 4 July 2009	Batch and environmental sampling
II	6 July – 12 September 2009	Batch and environmental sampling
Sentinel	10 – 31 October 2010	Sentinel placement and monitoring
III	02 November 2009 – 9 January 2010	Batch and environmental sampling
IV	11 January – 20 March 2010	Batch and environmental sampling

2.2. Study population

The study was conducted in 40 PCFs in five municipalities in DKI Jakarta. The selected PCFs were the same that had been involved in a previous surveillance study (CIVAS, 2007). The municipality and subdistrict in which each of the PCFs were located and the type of poultry which they traded is shown in Table 2.

Table 2. Location in DKI Jakarta and type of poultry which was traded by 40 PCFs participating in HPAI surveillance

Municipality	PCF Code	Location (Subdistrict)	Chicken Type
Central Jakarta	01 T	Cempaka Putih	Broiler
	02 T	Cempaka Putih	Broiler, spent layer, spent parent stock
	03 T	Johar Baru	Broiler
	04 T	Cempaka Putih	Native chicken
	05 T	Cempaka Putih	Native chicken
	06 T	Johar Baru	Broiler, spent layer, spent parent stock
	07 T	Johar Baru	Broiler, spent layer, spent parent stock
	08 T	Johar Baru	Broiler, spent layer, spent parent stock
East Jakarta	09 T	Matraman	Male layer
	10 T	Matraman	Broiler, Male layer
	11 T	Pulo Gadung	Spent layer, spent parent stock
	12 T	Pulo Gadung	Broiler
	13 T	Pulo Gadung	Broiler
	14 T	Pulo Gadung	Broiler
	15 T	Matraman	Broiler
	16 T	Makassar	Broiler
	17 T	Makassar	Broiler



Municipality	PCF Code	Location (subdistrict)	Chicken Type
North Jakarta	18 T	Tanjung Priok	Broiler
	19 T	Penjaringan	Native Chicken
	20 T	Koja	Broiler
	21 T	Cilincing	Broiler
	22 T	Cilincing	Broiler
	23 T	<ul style="list-style-type: none"> • Cilincing • Koja (new address) 	Broiler
	24 T	Pademangan	Broiler
West Jakarta	25 T	Kalideres	Male layer
	26 T	Cengkareng	Broiler
	27 T	<ul style="list-style-type: none"> • Kalideres • Tambora (replacement) 	<ul style="list-style-type: none"> • Broiler • Male layer
	28 T	Cengkareng	Male layer
	29 T	Kalideres	Broiler
	30 T	Cengkareng	Broiler, Spent parent stock
	31 T	Grogol Petamburan	Male layer
	32 T	Cengkareng	Native chicken
South Jakarta	33 T	Kebayoran Lama	Broiler, Spent layer Spent parent stock
	34 T	Kebayoran Lama	Broiler, Spent layer
	35 T	Kebayoran Lama	Spent parent stock
	36 T	Kebayoran Lama	Spent layer, Spent parent stock
	37 T	Kebayoran Lama	Broiler
	38 T	Kebayoran Lama	Broiler, Spent layer
	39 T	Kebayoran Lama	Male layer, Broiler
	40 T	Kebayoran Lama	Broiler

To gain participation from PCFs, the study protocol was socialized to PCF owners or managers. Socialization was conducted by the monitoring team from CIVAS and officers of the Marine and Agriculture Service Office of DKI Jakarta.

Unfortunately, 3 PCF dropped out near the end of the study (in Period IV). PCFs 04T and 05T in Central Jakarta refused sampling due to relocation issues and PCF 30T dropped out because it was no longer operating.

2.3. Sampling

2.3.1. Sample Type

Tracheal swabs were collected from chickens and sentinels as described by Suarez *et al* (2006). Blood samples were collected from spent layer and parent stock only. Environmental swabs were collected from holding pens.

2.3.2. Sample Size

The sample size for tracheal swabs and serum samples to be taken from the incoming poultry batches was calculated with a formula of Canon and Roe (2001), using an average batch size of 2000 birds, a confidence level of 90%, and an estimated prevalence of HPAI of 25%. The calculated sample size was 10



tracheal swab samples and 10 serum samples. A poultry batch was defined as a poultry delivery from one farm to one PCF in one day.

A total of five environmental swab samples were taken per PCF.

2.3.3. Sample Collection

The sample collection in the 40 PCFs was conducted by four teams working simultaneously, with each team consisting of two CIVAS staff members and one officer from the local Livestock Service Sub-office of the relevant municipality.

Each team was responsible for monitoring 10 PCFs and each PCF was monitored for six day per week at a time . After 10 weeks all PCFs had been monitored and this comprised a sampling period. Hence, during four sampling periods (Table 1), each PCF had been sampled on four separate occasions for periods of one week each.

Tracheal swab samples and environmental swab samples were placed in tubes containing 2 milliliters of Brain Heart Infusion (BHI) medium. All samples were transported on ice in a cool box and sent to the laboratory on the same day as they were collected.

2.3.3.1. Sample Collection of Incoming Poultry Batches

Sampling took place directly after arrival of the poultry to the PCF. Chickens were sampled directly from the crates or from within the holding pens as soon as they were unloaded. Samples were taken from sick, dead or healthy chickens in that order of preference. Sampling was limited to a maximum of 10 batches per day for all PCFs. Blood samples were only collected from spent layer hens and spent parent stock of which also tracheal swabs had been collected.

2.3.3.2. Sample Collection of the PCF Environment

The PCF environment was sampled by walking in the holding pens using boots covered with plastic covers. Any debris or manure attached to the plastic was collected on a moistened swab. This procedure was repeated until five swab samples had been collected.

2.4. Sentinel Chickens

The process of placing sentinel chickens into PCFs included acquisition, testing, and distribution.

2.4.1 Acquisition of Sentinel Chickens

The criteria for the selection of the sentinel chickens was that they should not have antibodies against AI, either obtained through vaccination or through natural infection. In order to fulfill these criteria, commercial layer chickens which were not vaccinated against AI were sourced from a farm in Wilo village, Prigen subdistrict, Pasuruan district in East Java. The 40 week old birds were of the Hi Line strain, originated from one flock. Those sentinels were sampled (10 sample) and tested before they were transported to PCFs with HI test to make



sure they were not have antibodies or obtained natural infection from the farm. The result of the test showed negative for AI.

Four-hundred and fifty-six chickens were transported to Bogor where they were temporarily held before distribution to the PCFs. Before transportation to Bogor, an animal health certificate was issued by the government veterinarian from the local district service office. The sentinel chickens arrived in Bogor on October 4, 2010 where they stayed until their distribution to the PCFs on October 10, 2010.

2.4.2 Testing of the Sentinel Chickens

During their stay in Bogor, the health of the sentinel chickens was monitored on a daily basis. On the second day of their stay, blood samples were collected to measure the AI antibody titer. Fifty sentinels were sampled, selected by simple random sampling, which was sufficient to detect HPAI in this population at an expected prevalence of 10% with more than 99% confidence. In addition, swab samples were collected from another 50 randomly selected birds and stored at the laboratory for possible future RT-PCR testing. Unfortunately these samples were lost before they could be tested.

All serum samples tested negative for the presence of HPAI antibodies which cleared the way for the sentinels to be distributed to the PCFs.

2.4.3 Distribution of the Sentinel Chickens

In total, 319 sentinel chickens were distributed to 40 PCFs. Each PCF received 8 sentinels, except for PCF 15T (East Jakarta) which received only 7 sentinels because 1 chicken died during transport. Sentinel distribution to PCFs in 5 municipalities (Central, East, North, West, and South Jakarta) was conducted by 5 teams. Each team consisted of 1-2 CIVAS personnel and 1 field officer from the local government service office. Each team only distributed sentinels in one municipality.

The sentinels were transported in plastic crates that were cleaned and disinfected before they were used. One crate was used per PCF. Sentinel delivery to PCFs was conducted starting from low-risk PCFs (PCFs which had not received PCR positive poultry batches during the two previous sampling periods) to high-risk PCFs (PCFs which had received one or more positive poultry batches during the two previous sampling periods).

The husbandry of the sentinel chickens within the PCFs followed the management of the particular PCF. In general it could be divided into two categories, (1) mixed, in which sentinels were released in the same pen as non-sentinel chickens and (2) caged, in which sentinels were kept in a small cage within the pen of the non-sentinel chickens. A total of 28 (57.5%) PCFs mixed the sentinels, while the remaining 17 (42.5%) PCFs caged them.

2.4.4 Monitoring of the Sentinel Chickens

Teams made up from CIVAS personnel and officers from the local livestock service office of the five municipalities in DKI Jakarta monitored the



management and health of the sentinels in the PCFs every 5 days or if there was a report of sick or dead sentinels. Monitoring included whether or not sentinels received sufficient feed and water. The PCF owners and/or workers completed daily reports and PCF data forms. They were instructed to immediately report dead sentinels to the monitoring officers so that samples could be collected.

2.4.5 Sample Collection of the Sentinel Chickens

Tracheal swab samples were collected from sentinels that had died in the PCFs during the monitoring period. Sentinels were monitored for a period of three weeks. At the end of the monitoring period, tracheal swab samples and blood samples were collected from all remaining sentinels in the PCFs.

2.5. Laboratory Testing

Tracheal swab samples, serum samples, and environmental swab samples were tested at the Fish and Animal Health Office Laboratory in DKI Jakarta.

In the laboratory, the tracheal swab samples of the incoming poultry batches were pooled by combining five swab samples. Therefore, from each sampled poultry batch, two pooled samples were tested. Equally, the five environmental swab samples which were taken from each PCF during each sampling period were combined into one pooled sample. Sentinel tracheal samples were tested individually. Pools of tracheal swabs and of environmental swabs and individual sentinel tracheal swabs were tested using a real time RT-PCR to detect genomic material of the matrix protein common to all influenza A type viruses. Positive pools were tested again with a RT-PCR to detect H5 AI genome.

Serum samples were tested for H5 AI antibodies using the Haemagglutination Inhibition (HI) test. Mean antibody titers were calculated per batch and expressed as percentage of batches with mean antibody titer $\leq 2^4$ or $>2^4$.

2.6. Poultry Collecting Facility Data Collection

Data collected during the study consisted of general PCF data, to obtain an overview of the PCF, and transportation questionnaire data for every batch that entered the PCFs. Data on biosecurity in PCFs and poultry transportation were also collected using a checklist.

2.6.1. General PCF Data

General data on PCFs were collected by interviewing PCF owners or managers. The general data included PCF size, pen type, the type and average number of chickens held, number of workers, average mortality rate, and map of the PCF. Data on husbandry and waste management practices in PCFs was also collected.



2.6.2. Questionnaire and Checklist

Questionnaires were developed to collect general data on PCFs, poultry transportation, source and type of chickens, poultry management in PCFs, waste management, and sanitation. Respondents in the study were PCF owners or managers and drivers of poultry transportation vehicles.

Meanwhile, checklists were used to assess violations of biosecurity aspects. In the PCF, biosecurity aspects observed included location, building, hygiene and sanitation, and rearing management. The biosecurity aspects observed in poultry transportation included the equipment used, sanitation of equipment, and personal hygiene. Violations were classified into minor, major, serious, and critical violations based on the risk of spreading AI. By taking into account the number and type of violations which were found, biosecurity levels were categorized into good, moderate, and poor (Table 3 and 4). The questionnaire and checklist can be found in Annex 2,3 and 4.

Table 3. Categorization of Biosecurity in PCFs

Biosecurity Level	Number of Violations			
	Minor	Major	Serious	Critical
Good	≤4	≤5	<8	0
Moderate	≤6	≤7	≤ 12	≤4
Poor	≤8	≤9	≤ 16	≤7

Table 4. Categorization of Biosecurity in poultry transportation

Biosecurity Level	Number of Violations			
	Minor	Major	Serious	Critical
Good	0	≤1	≤2	0
Moderate	≤1	≤3	≤3	≤1
Poor	>1	>3	>3	>1

2.7. Biosafety and Biosecurity

Biosafety and biosecurity measures were practiced to prevent AI viruses from spreading between PCFs and to prevent disease transmission to humans, particularly to the monitoring staff. Standard operating procedures were developed for all monitoring and sampling activities.

The standard operating procedures consisted of procedures for entering PCFs, collecting samples, labeling samples, leaving PCFs, entering posts, receiving samples, and sending samples.

Biosafety measures for the monitoring staff were the use of personal protective equipment (PPE) and vaccination against influenza.

2.8. Case Definitions

A poultry batch was categorized as HPAI infected if at least one of the two pooled tracheal swab samples was positive for H5 in the RT-PCR.

The environment of a PCF was categorized as HPAI contaminated if at least one of the pooled environmental samples collected from the PCF was positive for H5 in the RT-PCR.



A PCF was categorized as HPAI exposed if at least one poultry batch, environmental pooled sample or tracheal swab sample from a sentinel was positive for H5 with the RT-PCR.

2.9. Seasonal Data

The categorization of the wet and the dry season was based on standard rainfall data for Java (Banten, West java, Jakarta, Yogyakarta and Central Java) and south Sumatra (Lampung) for year 2009-2010 which was collected from the meteorology, climatology and geophysics agency of Indonesia (Badan Meteorologi Klimatologi dan Geofisika 2008, 2009, 2010).

2.10. Data Analysis

Data collected through questionnaires and laboratory testing was entered into an Excel spreadsheet then analyzed descriptively and statically using, SPSS16,0 for Windows (SPSS Inc., 2007) and Microsoft Excel 2007.



III. RESULTS

3.1 AI Infected Poultry Batches delivered to PCFs in DKI Jakarta

3.1.1 Prevalence of AI Infected Incoming Poultry Batches

The total number of incoming batches sampled during the study was 1549 batches. The numbers fluctuated each period because of variation in sales. The highest number of batches were sampled in period I (27 April – 4 July 2009) with 446 batches and the lowest number of batches were sampled in period IV (11 January – 20 March 2010) with 340 batches. The low number of batches in period IV was also influenced by the loss of 3 studied PCFs at the end of the study.

PCR testing of pooled tracheal swabs of chickens of incoming batches found 59 H5 positive pooled samples resulting in 50 infected batches (3.2%). The lowest percentage of AI infected batches was found in period II (6 July – 12 September 2009) with 2.3% (9 of 377 batches) being positive and the highest infection rate was found in period IV (11 January – 20 March 2010) with 5.3% (18 of 340 batches) testing positive. The number of sampled poultry batches and the prevalence of AI infected batches by sampling period is shown in Figure 1.

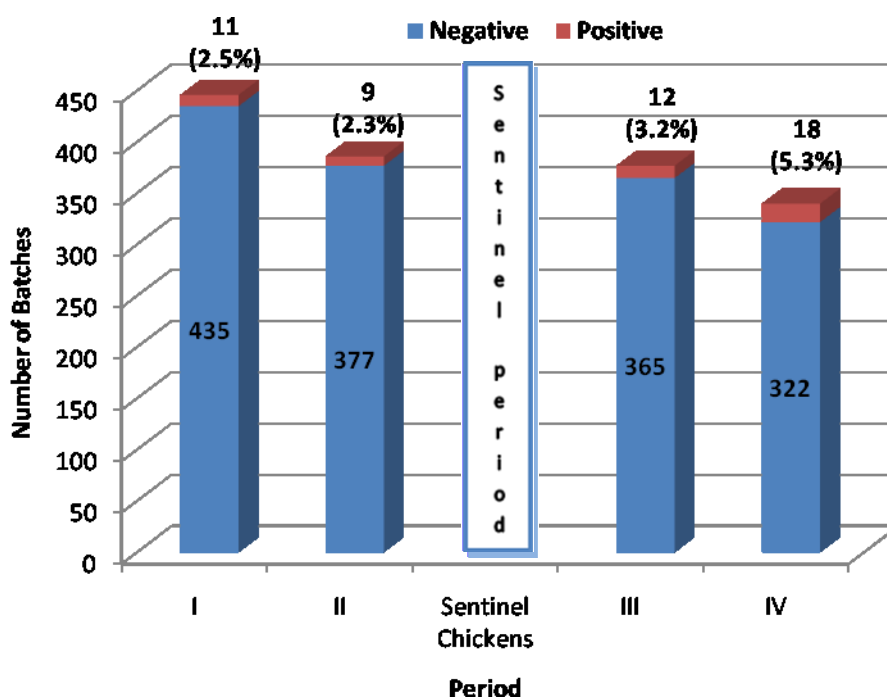


Figure 1. Number of Sampled Poultry Batches and AI Infection of Poultry Batches by Sampling Period

3.1.2 Distribution of AI Infected Poultry Batches delivered to PCFs in DKI Jakarta by Municipality

PCFs in North Jakarta received the highest proportion of infected poultry batches with 4.7%, followed by Central Jakarta (4.0%), East Jakarta (3.6%), West Jakarta (3.0%), and South Jakarta (1.3%). The percentage of AI infected poultry batches per municipality is shown in Table 5.

Table 5. Percentage of AI Infected Poultry Batches by Municipality in DKI Jakarta

Municipality	Number of Batches	Number of AI Infected Batches	Percentage
North Jakarta	171	8	4.7
Central Jakarta	321	13	4.0
East Jakarta	390	14	3.6
West Jakarta	370	11	3.0
South Jakarta	297	4	1.3
DKI Jakarta	1549	50	3.2

3.1.3 Characteristics of AI Infected Batches by Place of Origin and Poultry Type

Results indicate that AI infected birds were found in poultry batches originating from 5 of 7 supplying provinces. The 3 provinces with the highest percentage of AI infected poultry batches were Lampung (15%), Central Java (11.8%), and DI Yogyakarta (11.4%), whereas West Java and Banten provinces had a much lower percentage of 2.3% and 1.6% respectively. None of the batches coming from East Java and DKI Jakarta were infected.

On district/municipality level, 20 of 64 supplying districts/municipalities were found to have delivered AI infected poultry. Metro district in Lampung province had the highest percentage of AI infected batches (50.0%), while Tangerang district in Banten province had the lowest (0.6%) (Annex 5).

Based on the type of chickens, the highest AI infection rate was found in native chickens with 18.3%, followed by spent layers (3.1%), broilers (2.5%), spent parent stock (1.2%), and male layers (1.0%). The distribution of AI infected poultry batches by supplying province and by poultry type is shown in Table 6.

Table 6. Number of Sampled Batches and Number of AI Infected Batches (%) Based on Province of Origin and Poultry Type

Province	Broiler		Spent Layer		Male layer		Native chicken		Spent Parent Stock		Total	
	N	+ (%)	N	+ (%)	N	+ (%)	N	+ (%)	N	+ (%)	N	+ (%)
Banten	249	4 (1.6)	39	1 (2.6)	3	0	0	0	20	0	311	5 (1.6)
DKI Jakarta	3	0	2	0	0	0	0	0	0	0	5	0
West Java	667	16 (2.4)	118	4 (3.4)	200	2 (1.0)	7	0	49	1 (2.0)	1041	23 (2.2)
Central Java	73	2 (2.7)	0	0	0	0	52	14 (26.9)	2	0	127	16 (12.6)
East Java	0	0	1	0	0	0	0	0	9	0	10	0
Lampung	18	3 (16.7)	0	0	2	0	0	0	0	0	20	3 (15.0)
Yogyakarta	0	0	0	0	0	0	34	3 (8.8)	1	0	35	3 (8.6)
Total	1010	25 (2.5)	160	5 (3.1)	205	2 (1.0)	93	17 (18.3)	81	1 (1.2)	1549	50 (3.2)

*Male layer: The males of laying chicken lines that are raised for meat



The origin of the infected native chicken batches was confined to only two subdistricts in Central Java and one in Yogyakarta (Table 7). Available data show that 13 of 17 infected batches came from three villages, while the source village of four other batches is unknown. There were three infected batches from Terban village delivered to two PCFs (04T & 05T) during two sampling periods, two infected batches from Purbadana village delivered to one PCF (19T) during two sampling periods, and eight infected batches from Kembaran village delivered to one PCF (32T) during three sampling periods. Of the other four batches of which the village of origin is unknown, one batch was known to come from Sidareja subdistrict in Cilacap and delivered to one PCF (05T), while three other batches came from Kembaran subdistrict and were delivered to one PCF (19T). This makes it possible that these latter batches also originated from Purbadana village as did the other infected batches delivered to PCF 19T.

Infected batches of other poultry types never came from the same location.

Table 7. Place of Origin, Receiving PCF, Delivery Date and Consignment Size of AI infected Native Chicken Batches

Delivery Date	PCF Code	Consign-ment Size	Farm Origin			
			Village	Subdistrict	District	Province
Sampling period I						
8-May-09	19T	1500	Purbadana	Kembaran	Banyumas	Central Java
1-Jul-09	32T	1000	Kembaran	Kembaran	Banyumas	Central Java
Sampling period II						
31-Aug-09	32T	1000	Kembaran	Kembaran	Banyumas	Central Java
1-Sep-09	04T	1100	Terban	Gondokusuman	Yogyakarta Kota	Yogyakarta
2-Sep-09	32T	1000	Kembaran	Kembaran	Banyumas	Central Java
4-Sep-09	32T	1000	Kembaran	Kembaran	Banyumas	Central Java
5-Sep-09	32T	1000	Kembaran	Kembaran	Banyumas	Central Java
8-Sep-09	05T	1100	Terban	Gondokusuman	Yogyakarta Kota	Yogyakarta
Sampling period III						
11-Nov-09	19T	1000	Unknown	Kembaran	Banyumas	Central Java
6-Jan-10	05T	1800	Terban	Gondokusuman	Yogyakarta Kota	Yogyakarta
7-Jan-10	32T	2000	Kembaran	Kembaran	Banyumas	Central Java
8-Jan-10	05T	500	Unknown	Sidareja	Cilacap	Central Java
8-Jan-10	32T	2000	Kembaran	Kembaran	Banyumas	Central Java
9-Jan-10	32T	2000	Kembaran	Kembaran	Banyumas	Central Java
Sampling period IV						
19-Jan-10	19T	1000	Purbadana	Kembaran	Banyumas	Central Java
20-Jan-10	19T	1000	Unknown	Kembaran	Banyumas	Central Java
21-Jan-10	19T	1000	Unknown	Kembaran	Banyumas	Central Java

3.1.4 Association between AI infection and seasonality

Based on rainfall data from the Meteorology, Climatology, and Geophysics Agency, period I (27 April – 4 July 2009) and II (6 July – 12 September 2009) fell within the dry season, while period III (02 November 2009 – 9 January 2010) and IV (11 January – 20 March 2010) occurred during the rainy season (Annex 9). The study found a higher proportion of AI-infected batches in the rainy season than in the dry season (30/717 infected batches versus 20/832 infected batches). A chi-squared test comparing the prevalence of AI infected batches by season found statistically significant difference ($p=0.05$).

Table 8. Seasonal Distribution of AI Infected Poultry Batches Delivered to PCFs in DKI Jakarta

Sampling period	Date	Season	Total no of Batches	No of AI Infected Batches	Percentage of AI Infected Batches
I	27 April – 4 July 2009	Dry	446	11	2.5
II	6 July – 12 September 2009	Dry	386	9	2.3
Dry period			832	20	2.4
Sentinel Period					
III	2 November 2009 – 9 January 2010	Rainy	377	12	3.2
IV	11 January – 20 March 2010	Rainy	340	18	5.3
Rainy season			717	30	4.2
Total			1549	50	3.2

3.2 Spent Chickens

3.2.1 Serology Status of Spent Chickens

Blood samples were collected from 160 spent layer hen batches and 81 spent parent stock batches. Results show that almost 70 % of spent chicken batches had mean titers higher than 2^4 . AI antibody titers of spent hens are shown in detail in Table 9.

Table 9. Mean H5 Antibody Titers and Percentage of Batches with Titers Higher than 2^4 of Spent Chickens Delivered to PCFs in DKI Jakarta

Chicken Type	Total number of batches sampled	Mean titer (SD)	No of batches $>2^4$	Percentage
Spent layer hens	160	5.03 ± 1.94	117	73.1
Spent parent stock	81	4.80 ± 2.14	49	60.5
Total	241	4.95	170	68.9

3.2.2 Association Between Serological Status and AI Positive Spent Chicken Batches

The number of AI positive spent chicken batches with mean titers less than or equal to 2^4 and those with titers higher than 2^4 are shown in Table 10. Testing for an association between AI infection status and titer group did not yield a statistically significant result (Fisher exact test $p=0.38$).

Table 10. Association between H5 Status and Serological Titer Group of Spent Chicken Batches brought to PCFs in DKI Jakarta

	H5 positive batches	H5 negative batches	Total
No of batches $\leq 2^4$	3	72	75
No of batches $> 2^4$	3	163	166
Total	6	235	241

3.3 AI Detection in the PCF Environment

3.3.1 AI detection using environmental swabs

The study collected 157 pooled environmental samples whereby each pool was made up of five swab samples taken from one PCF during one sampling period. Three PCFs dropped out in sampling period IV and no environmental samples were taken. Testing of the PCF environment found 13 of 157 environmental pooled swab samples positive for AI (8.3%). PCFs in East Jakarta had the highest proportion of positive test results (11.1%), followed by PCFs in North Jakarta (10.7%), West Jakarta (9.7%), and Central Jakarta (10.0%). None of the environmental samples from PCFs in South Jakarta were positive for AI. Overall, 12 PCFs (30.0%) had one or more AI positive pooled environmental sample taken during the four sampling periods (Table 11).

Table 11. Percentage of AI-infected PCFs by municipality on the basis of AI positive environmental swabs

Municipality	No of PCFs	Pooled Environmental Samples		No of Positive PCFs	Percentage
		N	Positive (%)		
East Jakarta	9	36	4 (11.1)	4	44.4
North Jakarta	7	28	3 (10.7)	3	42.9
West Jakarta	8	31	3 (9.7)	2	25.0
Central Jakarta	8	30	3 (10.0)	3	37.5
South Jakarta	8	32	0	0	0.0
DKI Jakarta	40	157	13 (8.3)	12	30.0

3.3.2 Association between AI infected incoming poultry batches and AI positive environmental swab samples

Not all PCFs with AI positive environmental samples had received AI positive poultry batches during that same week nor had all PCFs that received AI positive batches had corresponding AI positive environmental swabs. The association between AI infected poultry batches and positive environmental swabs is shown in a 2x2 table (Table 12) and had a corresponding odds ratio of 5.3 ($p < 0.001$). This means that PCFs that had AI positive poultry batches delivered were 5.3 times more likely to have an AI positive environmental swab during that same sampling week

Table 12. Association between AI positive Poultry Batches and AI positive Environmental Swabs

	Positive Environment	Negative Environment	Total
Positive Batch	7	26	33
Negative Batch	6	118	124
Total	13	144	157

Fisher Exact test: OR=5.3, 95% CI 1.44-19.75, $p < 0.01$

3.4 AI Detection Using Sentinel Chickens

Of the 319 sentinel chickens which were placed in the PCFs, 185 died, 43 went missing and 91 sentinels survived until the end of the observation period. Therefore, a total of 276 tracheal swab samples were collected from the dead and live sentinels and 91 blood samples were collected from the surviving birds at the end of the observation period. Of the 185 dead sentinels, 89% ($n=164$) tested positive in the H5 PCR. Three live sentinels (3%) also tested positive. All serological samples were negative ($<2^1$).

Based on these results, 31 out of 40 PCFs (77.5%) had housed one or more sentinels that tested positive for AI. Based on the manner in which these sentinels were housed, 19 of 23 PCFs (82.6%) that allowed the sentinels to roam freely in collecting facility pens (mixed management) had one or more AI positive sentinels, as opposed to 12 out of 17 PCFs (70.6%) that caged the sentinels. Also, a higher proportion of sentinel chickens that were kept in mixed management died and tested positive for H5 compared to those that were kept caged (Table 13). This difference in proportion of AI infected sentinels under different management systems was not statistically significant ($p = 0.16$).

Table 13. Number of Placed Sentinels, Dead Sentinels and H5 Positive Sentinels Under Different Management Systems in PCFs in DKI Jakarta

Management type	Number of sentinels placed	Number of sentinels died (%)	Number of sentinels H5 positive (%)	Number of PCFs	Proportion of positive PCFs
Mixed	183	110 (60.1)	102 (55.7)	23	19 (82.6)
Caged	136	75 (55.1)	65 (47.8)	17	12 (70.6)
Total	319	185 (58.0)	167 (52.4)	40	31 (77.5)

3.5 PCF Exposure to AI virus Based on Incoming Poultry Batches, Environmental Samples and Sentinel Chickens

Table 14 shows an overview of all sampled PCFs and their exposure status to AI virus based on incoming poultry batches, environmental swab samples and sentinel chickens. PCFs with the most H5 positive poultry batches were PCF 32T, 02T, and 19T with 8, 5, and 5 infected batches, respectively. PCF 27T was the only collector house which had a H5 positive environmental sample during two sampling periods.

Overall, evidence of H5 AI virus exposure was found in 34 (85.0%) of the 40 PCFs sampled in the study. Only in six PCFs, exposure to AI virus could not be demonstrated during any of the sampling periods. Of the 34 positive PCFs, 12

PCFs were exposed to AI on the basis of one source, 13 PCFs on the basis of two sources, and nine PCFs on the basis of three sources.

Tabel 14. Exposure of PCFs to AI Virus Based on Incoming Poultry Batches, Environmental Samples and Sentinel Chickens

Municipality	PCF Code	Exposed to AI virus	H5 positive batches ¹	H5 positive environmental samples	H5 positive sentinels	No of sources
Central Jakarta	01 T	Yes	-	1	Yes	2
	02 T	Yes	4B, 1SL	1	Yes	3
	03 T	Yes	-	-	Yes	1
	04 T	Yes	1N	-	Yes	2
	05 T	Yes	3N	-	Yes	2
	06 T	Yes	-	1	Yes	2
	07 T	Yes	4B	-	Yes	2
	08 T	Yes	-	-	Yes	1
East Jakarta	09 T	Yes	-	-	Yes	1
	10 T	Yes	1B	-	Yes	2
	11 T	Yes	3SL, 1SP	1	Yes	3
	12 T	Yes	3B	1	Yes	3
	13 T	Yes	1B	-	Yes	2
	14 T	Yes	1B	-	Yes	2
	15 T	Yes	-	1	Yes	2
	16 T	Yes	-	-	Yes	1
North Jakarta	17 T	Yes	4B	1	Yes	3
	18 T	Yes	1B	1	Yes	3
	19 T	Yes	5N	1	Yes	3
	20 T	Yes	1B	1	Yes	3
	21 T	No	-	-	No	0
	22 T	No	-	-	No	0
	23 T	Yes	1B	-	Yes	2
West Jakarta	24 T	Yes	-	-	Yes	1
	25 T	Yes	1ML	-	Yes	2
	26 T	Yes	1B	-	No	1
	27 T	Yes	1B	2	Yes	3
	28 T	Yes	-	-	Yes	1
	29 T	Yes	-	-	Yes	1
	30 T	No	-	-	No	0
	31 T	Yes	-	-	Yes	1
South Jakarta	32 T	Yes	8N	1	Yes	3
	33 T	Yes	1B	-	No	1
	34 T	No	-	-	No	0
	35 T	No	-	-	No	0
	36 T	Yes	1SL	-	No	1
	37 T	Yes	-	-	Yes	1
	38 T	No	-	-	No	0
	39 T	Yes	1ML	-	Yes	2
Total PCFs	40 T	Yes	1B	-	Yes	2
		34	22	12	31	

¹: B=broiler; N=native chicken; ML=male layer; SL=spent layer; SP=spent parent stock

3.6 Biosecurity Assessment

3.6.1 PCF Biosecurity

Assessment of the level of biosecurity present in the PCFs which were sampled during this study, found that none of the PCFs could be classified as having good biosecurity. There were 36 PCFs which fell into the category of having moderate biosecurity levels whereas four PCFs were assessed to have poor biosecurity levels.

The most commonly found critical violations of biosecurity, were the absence of isolation cages to separate sick from healthy chickens and the absence of health inspection of new chickens arriving at the PCF. These biosecurity practices were not present in 38 PCFs. Other biosecurity violations which were deemed serious were the absence of disinfection facilities for vehicles and people, the lack of personal protective equipment for workers coming into contact with poultry and a general lack of hygienic working practices. These violations were observed in 39 PCFs.

3.6.2 Biosecurity related to the Transport of poultry batches

The most commonly found critical biosecurity violation related to the transport of poultry was the absence of vehicle disinfection upon leaving the PCF, which occurred in 98.7% of the observed transports. The most common serious biosecurity violation was not cleaning crates after every delivery which was the case in 74.6% of the observed transports, whereas a major biosecurity violation which occurred in more than 99.6% of the transports was the failure to disinfect crates and vehicles after every delivery (Annex 8).

IV. DISCUSSION

During 40 weeks of sampling in 40 PCFs located in DKI Jakarta, 3.2% of the sampled poultry batches were found to be positive with the H5 PCR. This percentage of H5 positive batches was slightly higher than the H5 prevalence of 1.4% which was found during a similar study conducted in 2008 (CIVAS, 2009). However, the study in 2008 was carried out over a shorter time period (5 months) and sampled a smaller number of PCFs (12), using a different sampling strategy. The results therefore are not directly comparable.

It is difficult to extrapolate these results to poultry batches arriving in the rest of Jakarta. The 40 PCFs who participated in this study were not randomly selected and might not be representative for other PCFs in Jakarta. During the 960 days on which sampling took place in this study, a total of 1549 poultry batches were sampled. This equates to an average of only 1.6 batch per day. Taking into consideration that an estimated several hundred poultry batches arrive in Jakarta every day, our sample size was very small and consequently the precision of our prevalence estimate very low. It is possible that our estimate is in fact an underestimate. By sampling only ten birds per poultry batch, our limit of detecting AI with 95% confidence was confined to a minimum within-batch prevalence of 25%. This within-batch prevalence might not always be reached, especially not in vaccinated spent layer and parent stock flocks or in native chicken batches which are sourced in small quantities from different locations. Even so, the results of our surveillance during 2008 and 2009/2010 highlight the fact that a steady supply of H5 infected poultry batches enter Jakarta on a regular basis, although the magnitude of infected poultry batches cannot be deduced from this data.

The number of H5 PCR positive poultry batches which were detected during sampling periods III & IV was significantly higher than the number detected during sampling periods I & II. Sampling period I & II coincided with the dry season in Indonesia whereas sampling period III and IV occurred during the wet season. A seasonal pattern of HPAI infection in poultry has been reported previously. A Local Disease Control Centre (LDCC) report from Bandung district stated that AI incidence was high in the rainy season and low in the dry season (LDCC, 2008). Similarly, a report from the Emergency Preparedness System (EMPRESS) of the Food and Agriculture Organization (FAO), which was based on reports from the Participatory Disease Response and Surveillance (PDSR) in Indonesia, also concluded that HPAI cases in areas reached by PDSR were highest in the rainy season (EMPRES/FAO-GLEWS, 2010). Higher infection rates in the rainy season could be the result of increased stress for poultry caused by inclement weather and/or because of increased virus persistence in the environment due to higher levels of humidity (WHO 2004).

Of all poultry types, native chickens were found to have the highest batch prevalence, 18.3% or 17 AI infected batches. It was remarkable to find that all 17 batches came from only two subdistricts in Central Java and one subdistrict in Yogyakarta and that the 13 batches, for which complete information was

available on the origin of the batches, came from only three villages. A majority of the infected native chicken batches (eight batches) came from the village Kembaran and were detected during three separate sampling periods. This implies not only that HPAI outbreaks were occurring in this area of Java during our study, but also that these outbreaks were sustained or frequently re-occurred over a period of at least six months. This raises serious questions about the efficacy or absence thereof, of the control measures taken in this area. Alternatively, it could be that one or more local collecting facilities, where backyard poultry are congregated while awaiting shipment to Jakarta, became contaminated with circulating virus and repeatedly infected batches of native chickens, either on site or during transport. More information is required about the native chicken marketing procedures which are used in these rural areas of Java in order to design and conduct proper intervention strategies.

The occurrence of infected poultry batches was not uniformly distributed across the 40 PCFs in that 60% of the infected batches (n=30) which were detected during the four sampling periods, occurred in only six PCFs. PCF 02T, 07T, 11T, 17T, 19T, and 32T all received four or more infected batches during this study. PCF 19T and 32T traded only in native chickens and received infected poultry batches from Kembaran subdistrict. PCF 11T participated in the surveillance study during 2008 and was responsible for six of the eight infected batches which were detected during that study (CIVAS 2009). Anecdotal reports have been circulating that the management of some PCFs target the purchase of sick flocks for a reduced price. Whether or not this can be an explanation for the clustering of infected batches within a small number of PCFs which we found in this study or that this clustering is simply due to chance is unknown and requires further investigation.

During the surveillance study in 2008, 75% of the infected batches were spent layers or spent parent stock. This aroused our curiosity as to whether infected spent layer or parent stock batches were more likely to have lower antibody titers, possibly due to lower vaccination coverage. The present study found no significant association between mean H5 antibody titers and infection status of spent layer and parent stock batches when comparing batches with mean titers equal or less than 2^4 with batches with mean titers greater than 2^4 .

PCFs which received a H5 infected poultry batch were more than five times as likely to have a H5 positive environmental sample taken during the same week than PCFs which did not receive H5 infected poultry batches. This suggests that virus brought into the PCF by poultry consignments is a risk factor for PCF contamination and has implications for public health and HPAI transmission. Questionnaire data demonstrate that biosecurity is poor in most of the surveyed PCFs which might well be part of the problem. HPAI exposure of poultry workers, poultry consumers or people living in the vicinity of PCFs can on the basis of these results not be excluded. Although we have no direct evidence for this, there is high risk that PCFs serve as HPAI transmission hubs whereby infected poultry batches contaminate the environment of the PCF after which,

due to the lack of proper cleaning and disinfection, it is spread to other poultry farms by contaminated workers, vehicles and equipment especially crates.

Twelve out of 40 PCFs (30%) had one or more H5 positive environmental samples taken during the four sampling periods. This was in contrast to 31 out of 40 PCFs (76%) in which one or more sentinel chickens became infected with HPAI during a three week monitoring period. Although these detection methods were employed at different time periods and are therefore not directly comparable, it does suggest that using sentinels is a more sensitive method to demonstrate HPAI in a PCF environment than swab samples. Reasons for the apparent lower sensitivity of environmental swabs as compared to sentinels are several. Sentinels were used over a time period of three weeks whereas swab samples were taken at four separate time points. Although it was attempted to increase the sensitivity of the swab samples by taking five individual swabs, thereby increasing the monitored area inside the PCF, the fact that these swabs were then pooled could have actually decreased the sensitivity by the process of dilution. In addition, the sensitivity of the PCR could have been decreased by inhibitory substances in the sample, such as can be found in faecal and bedding material (Bessetti 2007).

The proportion of PCFs which were found with evidence for the presence of HPAI virus on the basis of infected sentinels was comparable to the 84% of PCFs which were found contaminated during a similar study employing sentinels in April 2007 (CIVAS 2008). This implies that not much has changed over a two year time period and that the proportion of HPAI contaminated PCFs remains high. When used properly, sentinel chickens are an extremely sensitive method to detect HPAI in poultry flocks. Although logistics and costs make it perhaps a less popular method than environmental swabs, the results of this study have demonstrated that it deserves to be used more frequently in future surveillance studies in Indonesia.

In conclusion, positive batches coming into Jakarta and the extremely high percentage of contaminated collecting facilities could serve as a major risk for human infections, particularly for people who work in the facilities, handle, and sometimes slaughter chickens. Furthermore, crates and trucks used by infected poultry have a high likelihood to be contaminated by the virus, either during the transportation process itself or during unloading at the collecting facilities. Drivers, workers, cages and trucks are generally not cleaned and disinfected but go directly to other farms to collect chickens and could be a major risk in spreading AI. Locations, farms, or local collecting facilities, from where repeatedly positive batches are detected are also a major risk factor in spreading the virus.

V. CONCLUSIONS

1. HPAI virus was found in 3.3% of poultry batches delivered to 40 PCFs located in the five municipalities of DKI Jakarta. From this data, no reliable estimate can be made about the total number of HPAI infected batches which are brought to PCFs in DKI Jakarta because of non-random selection of the PCFs and a small sample size. It does imply that there is a steady influx of HPAI infected poultry into Jakarta on a regular basis.
2. The number of HPAI infected poultry batches was significantly higher during the last two sampling periods covering the period from November 2009 until March 2010 which coincided with the rainy season in Indonesia.
3. A large proportion of HPAI infected poultry batches were native chickens. Infected native chicken batches originated from only three subdistricts in Central Java and Yogyakarta and were delivered to Jakarta during all four sampling periods.
4. Six PCFs received 60% of the HPAI infected poultry batches.
5. PCFs receiving one or more HPAI infected poultry batches were five times more likely to have a contaminated collector house environment during that same week based on H5 positive environmental swab samples than PCFs not receiving HPAI infected poultry batches.
6. The use of sentinel chickens appears to be a more sensitive method to detect HPAI virus within the PCF environment than environmental swab samples, when used according to the protocol in this study.
7. Based on detection by sentinel chickens, 78% of monitored PCFs had evidence for the presence of HPAI over a three week period.
8. In general, biosecurity within PCFs and during transport is of a low standard.
9. HPAI surveillance in PCFs can help to locate outbreaks in the field and identify high risk areas and PCFs.

VI. RECOMMENDATIONS

1. In order to reduce the potential role of PCFs with regard to public health and HPAI disease transmission between poultry flocks, an extensive socialization campaign is needed to improve biosecurity measures in these establishments. These biosecurity measures should consist of cleaning and disinfection of vehicles, equipment and workers, proper waste management and disposal, proper management and disposal of sick and dead poultry and restriction of access to the public.
2. Relocation of PCFs to non-residential areas of Jakarta is urgently required.
3. The use of sentinels in surveillance programs has proven to be a sensitive method of disease detection and would be a useful tool to measure the effect of cleaning and disinfection and other biosecurity applications.
4. In the absence of formal surveillance programs on commercial farms in Indonesia, surveillance activities such as described in this study can provide important information on the disease status of these commercial farms.
5. More investigation is needed on the role of marketing practices and local collecting facilities in the transmission of HPAI between native chicken flocks.
6. The reasons why certain PCFs have higher occurrences of HPAI infected poultry batches are unclear and need further research.

REFERENCES

- Besetti, J., 2007. An introduction to PCR inhibitors. *Journal of Microbiology Method* 28, 159-167.
- [BMG] Badan Meteorologi Klimatologi dan Geofisika (Indonesian Agency for Meteorology, Climatology, and Geophysics). 2009. Prakiraan Musim Hujan 2009/2010 (Rainy Season Estimation for 2009/2010). http://iklim.bmg.go.id/musim_MK2009.zip [August 2011]
- Bridges, C.B., Katz, J.M., Seto, W.H., Chan, P.K.S., Tsang, D., Ho, W., Mak, K.H., Lim, W., Tam, J.S., Clarke, M., 2000. Risk of influenza A (H5N1) infection among health care workers exposed to patients with influenza A (H5N1), Hong Kong. *Journal of Infectious Diseases* 181, 344.
- Cannon and Roe. 2001. Sample Size to Detect Presence or Absence of Disease, *Electronic Field Survey Tables*
- [CIVAS] Center for Indonesian Veterinary Analytical Studies. 2007. Avian Influenza Surveillance in Poultry Collecting Facilities in DKI Jakarta Province. [Final Report]. Bogor.
- [CIVAS] Center for Indonesian Veterinary Analytical Studies. 2009. Detection of Avian Influenza Virus in Poultry Arriving at Poultry Collecting Facilities (PCFs) and its Environment in DKI Jakarta. [Report]. Bogor.
- Dinas Kependudukan dan Catatan Sipil Provinsi DKI Jakarta (Citizenship and Civil Records Service Office for DKI Jakarta Province). 2010. Jumlah Penduduk Provinsi DKI Jakarta (Population of DKI Jakarta Province). http://www.kependudukancapil.go.id/index.php?option=com_content&view=category&layout=blog&id=42&Itemid=48 [April 2010]
- EMPRES/FAO-GLEWS. 2010. H5N1 HPAI Global Overview-March 2010 Issue No 21. FAO, Rome, p. 5.
- Katz, J.M., Veguilla, V., Belser, J.A., Maines, T.R., Van Hoven, N., Pappas, C., Hancock, K., Tumpey, T.M., 2009. The public health impact of avian influenza viruses. *Poultry Science* 88, 872-879.
- [LDCC] Local Disease Control Centre. 2008. The number of reported positive AI Rapid Tests in the LDCC district Bandung in 2007-2008. Bandung.
- OIE-World Organization for Animal Health. 2004. Avian influenza: First case confirmed in Indonesia. <http://www.oie.int/for-the-media/press-releases/detail/article/avian-influenza-first-case-confirmed-in-indonesia/> [August 2011]

- Pemerintah Provinsi DKI Jakarta (Provincial Government of DKI Jakarta). 2008c. Kerugian akibat flu burung capai Rp 4,1 Triliun (Economic loss from bird flu reaches 4.1 trillion rupiahs). <http://www.jakarta.go.id/v21/info/?act=detil&idb=1493&lg=1> [June 2008].
- Rezza, G., 2004. Avian influenza: a human pandemic threat? *British Medical Journal* 58, 807
- Senne, D.A., Pedersen, J.C., Panigrahy, B., 2003. Live-bird markets in the Northeastern United States: a source of avian influenza in commercial poultry. In, pp. 19–24.
- SPSS Inc., -. 2007. SPSS 16.0 for Windows.
- Suarez, D.L., Das, A., Ellis, E., 2007. Review of rapid molecular diagnostic tools for avian influenza virus. *Avian diseases* 51, 201-208.
- Trampuz, A., Prabhu, R.M., Smith, T.F., Baddour, L.M., 2004. Avian influenza: a new pandemic threat? In, pp. 523-532.
- [WHO] World Health Organization. Avian influenza ("bird flu") - Fact sheet. http://www.who.int/csr/disease/avian_influenza/avianinfluenza_factsheetJan2006/en/#history [August 2010].
- [WHO] World Health Organization. 2004. Laboratory study of H5N1 viruses in domestic ducks: main findings. http://www.who.int/csr/disease/avian_influenza/labstudy_2004_10_29/en/ [January 2009]
- [WHO] World Health Organization. 2005. Promoting healthy food markets-strategy and plans. http://www.searo.who.int/LinkFiles/Publications_and_Documents_promoting.pdf [February 2008]
- [WHO] World Health Organization. 2011. Avian Influenza Situation in Indonesia http://www.who.int/csr/don/2011_06_03/en/index.html [August 2010]



ANNEXES

Avian Influenza Virus Detection in the Environment and
Poultry Coming to Poultry Collecting Facilities (PCFs) in DKI Jakarta

2009

2010

Annex 1. General Characteristic of Sampled PCFs in DKI Jakarta

1. Poultry Collecting Facility 01T

I. General Data

1. PCF Name : Hadi Jaya
2. PCF Code : 01T
3. PCF Address : Jl. Pangkalan Asem No.2 Cempaka Putih
Central Jakarta
4. Owner : Roy Hadi
5. Owner's Address : Jl. Pangkalan Asem No.2 Cempaka Putih
Central Jakarta
6. Manager : Roy Hadi
7. Contact number : 021 4214781
8. Poultry type : Broiler
9. PCF size : 300 m²
10. Chicken pen type : Raised
11. Pen capacity : 8000 birds
12. Number of pens : 1
13. Average number of poultry : 5000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 14 people
16. Number of workers in contact with poultry : 10 people
17. Average poultry mortality : 35 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure sold.
- Manure in pens removed more than once a week.
- Pens cleaned by sweeping.

2. Poultry Collecting Facility 02T

I. General Data

1. PCF Name : Dunia Unggas
2. PCF Code : 02T
3. PCF Address : Jl. Pangkalan Asem No.6 Cempaka Putih
Central Jakarta
4. Owner : Edi Wijaya
5. Owner's Address :
6. Manager : Aris
7. Contact number : 081310763526 (021) 4213752
8. Poultry type : Broiler , spent layer and parent stock
9. PCF size : 1200 m²
10. Chicken pen type : Raised
11. Pen capacity : 8000 birds
12. Number of pens : 2 (divided into 6)
13. Average number of poultry : 6000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 25 people
16. Number of workers in contact with poultry : 10 people
17. Average poultry mortality : 30-40 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens do not use rice hulls as litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed every day.
- Pens cleaned by washing and sweeping.

3. Poultry Collecting Facility 03T

I. General Data

1. PCF Name : -
2. PCF Code : 03T
3. PCF Address : Jl. Pangkalan Asem Kel Galur 07/01 No 6
Central Jakarta
4. Owner : Iwan
5. Owner's Address :
6. Manager : Umar
7. Contact number : 021 4227283
8. Poultry type : Broiler and spent parent stock
9. PCF size : 150 m²
10. Chicken pen type : Raised and Stage
11. Pen capacity : 3000 birds
12. Number of pens : 4 Raised and 2 stage pens
13. Average number of poultry : 3000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 10 people
16. Number of workers in contact with poultry : 8 people
17. Average poultry mortality : 3 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping.

4. Poultry Collecting Facility 04T

I. General Data

1. PCF Name : -
2. PCF Code : 04T
3. PCF Address : Pasar Jaya Cempaka Putih A L00 gh 80 dan 81 Central Jakarta
4. Owner : H. Sutarman
5. Owner's Address :
6. Manager : H. Sutarman
7. Contact number : 08128095651
8. Poultry type : Native chicken
9. PCF size : 9 m²
10. Chicken pen type : Stage
11. Pen capacity : 500 birds
12. Number of pens : 1
13. Average number of poultry : 1500 birds
14. Poultry origin : Terban Market, Yogyakarta (Broker)
15. Number of PCF workers : 4 people
16. Number of workers in contact with poultry : 3 people
17. Average poultry mortality : 5 birds/day

II. Poultry Management and Waste Management

- PCF located more than 25 metres from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens do not use litter.
- Poultry manure disposed to garbage site.
- Manure in pens is removed more than once a week.
- Pens cleaned by sweeping.

5. Poultry Collecting Facility 05T

I. General Data

1. PCF Name : SHR
2. PCF Code : 05T
3. PCF Address : Pasar Jaya Cempaka Putih Central Jakarta
4. Owner : Syahrul
5. Owner's Address :
6. Manager : Syahrul
7. Contact number :
8. Poultry type : Native chicken
9. PCF size : 6 m²
10. Chicken pen type : Board
11. Pen capacity : 200 birds
12. Number of pens : 1
13. Average number of poultry : 200 birds
14. Poultry origin : Terban Market in Yogyakarta, Indramayu, Cialacap dan Pamanukan (Broker)
15. Number of PCF workers : 2 people
16. Number of workers in contact with poultry : 2 people
17. Average poultry mortality : 2-3birds/day

II. Poultry Management and Waste Management

- PCF located more than 25 metres away from residential housing.
- PCF not fenced.
- Chicken pens do not use litter.
- Poultry manure disposed to garbage site.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping.

6. Poultry Collecting Facility 06T

I. General Data

1. PCF Name : AA
2. PCF Code : 06T
3. PCF Address : Jl. Pangkalan Asem No.73 Johar Baru
Central Jakarta
4. Owner : Ahuang
5. Owner's Address :
6. Manager : Ahuang
7. Contact number : 021 4202373
8. Poultry type : Spent layer, broiler and spent parent stock
9. PCF size : 60 m²
10. Chicken pen type : Raised and board
11. Pen capacity : 2500 birds
12. Number of pens : 1
13. Average number of poultry : 2000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 10 people
16. Number of workers in contact with poultry : 4 people
17. Average poultry mortality : 5 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping and washing.

7. Poultry Collecting Facility 07T

I. General Data

1. PCF Name :
2. PCF Code : 07T
3. PCF Address : Jl. Pangkalan Asem Kel Galur 08/07 No 61
Central Jakarta
4. Owner : Yohanes
5. Owner's Address :
6. Manager : Naryo
7. Contact number : 081319931431
8. Poultry type : Broiler, spent layer and parent stock
9. PCF size : 250 m²
10. Chicken pen type : Raised and board
11. Pen capacity : 3000 birds
12. Number of pens : 2 (divided into 8)
13. Average number of poultry : 3000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 20 people
16. Number of workers in contact with poultry : 12 people
17. Average poultry mortality : 3-5 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens do not use litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping.



8. Poultry Collecting Facility 08T

I. General Data

1. PCF Name : Usaha Mandiri
2. PCF Code : 08T
3. PCF Address : Jl. Pangkalan Asem No 23 Kel.Galur 02/07
4. Owner : Aliong
5. Owner's Address :
6. Manager : Sesi (Pola)
7. Contact number : 08128917979
8. Poultry type : Broiler, spent layer and parent stock
9. PCF size : 100 m²
10. Chicken pen type : Raised and board
11. Pen capacity : 5000 birds
12. Number of pens : 1(divided into 6)
13. Average number of poultry : 4000 birds
14. Poultry origin : Directly from farm and broker
15. Number of PCF workers : 30 people
16. Number of workers in contact with poultry : 20 people
17. Average poultry mortality : 5-10 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping.



9. Poultry Collecting Facility 09T

I. General Data

1. PCF Name : Sawah
2. PCF Code : 09T
3. PCF Address : Jl. Kramat Asem Raya, Utan Kayu Selatan, Matraman – East Jakarta
No Telp 021 8583145, 8565824
4. Owner : Ibu Sumartina
5. Owner's Address : Jl. Kramat Asem Raya, Utan Kayu Selatan, Matraman – East Jakarta
No Telp 0811860451
6. Manager : Ibu Sumartina
7. Contact number : 0811860451
8. Poultry type : Male layer
9. PCF size : 96 m²
10. Chicken pen type : Raised
11. Pen capacity : 6000 birds
12. Number of pens : 1
13. Average number of poultry : 2000-3000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 4 people
16. Number of workers in contact with poultry : 4 people
17. Average poultry mortality : 2-5 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens do not use litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed at irregular intervals.
- Pens cleaned by washing.



10. Poultry Collecting Facility 10T

I. General Data

1. PCF Name : Sinar Fajar
2. PCF Code : 10T
3. PCF Address : Jl. Puspa III, Utan Kayu Selatan Rt 08/06,
Matraman – East Jakarta
No Telp 021 8520226
4. Owner : Ibu Ismawan
5. Owner's Address : Jl. Puspa III, Utan Kayu Selatan Rt 08/06,
Matraman – East Jakarta
6. Manager : Ibu Ismawan
7. Contact number : 021 8520226
8. Poultry type : Broiler and male layer
9. PCF size : 900 m²
10. Chicken pen type : Raised
11. Pen capacity : 10000 birds
12. Number of pens : 2
13. Average number of poultry : 4000 – 5000 birds
14. Poultry origin : Broker
15. Number of PCF workers : 7 people
16. Number of workers in contact with poultry : 7 people
17. Average poultry mortality : 10 - 30 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens do not use litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping.

11. Poultry Collecting Facility 11T

I. General Data

1. PCF Name : Hadi
2. PCF Code : 11T
3. PCF Address : Jl. Pisangan Lama Timur I No 64,
East Jakarta, No Telp 021 4752858
4. Owner : Bpk. Suhadi
5. Owner's Address : -
6. Manager : Bp Hendro
7. Contact number : 081319424475
8. Poultry type : Parent stock and spent layer
9. PCF size : 90 m²
10. Chicken pen type : Raised
11. Pen capacity : 1500 birds
12. Number of pens : 1
13. Average number of poultry : 1000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 8 people
16. Number of workers in contact with poultry : 6 people
17. Average poultry mortality : 5 - 10 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens do not use litter.
- Poultry manure disposed to garbage site.
- Manure in pens is removed more than once a week
- Pens cleaned by washing.

12. Poultry Collecting Facility 12T

I. General Data

1. PCF Name : UD Rosalia
2. PCF Code : 12T
3. PCF Address : Jl. Pintu Air, Pulo Gadung, East Jakarta
No telp 021 4754031
4. Owner : Bapak Agus Widodo
5. Owner's Address :
6. Manager : Bapak Untung Prabowo, Bapak Ivan
7. Contact number : 021 4754031 (Bp Untung), 081399977202
8. Poultry type : Broiler
9. PCF size : 200 m²
10. Chicken pen type : Raised
11. Pen capacity : 4000 birds
12. Number of pens : 1
13. Average number of poultry : 7000 birds
14. Poultry origin : Broker
15. Number of PCF workers : 15 people
16. Number of workers in contact with poultry : 12 people
17. Average poultry mortality : 30 birds/day

II. Poultry Management and Waste Management

- PCF located more than 25 metres away from residential housing.
- PCF not fenced.
- Chicken pens use saw dust as litter.
- Poultry manure is sold.
- Manure in pens is regularly removed every 10 days
- Pens cleaned by sweeping.

13. Poultry Collecting Facility 13T

I. General Data

1.	PCF Name	: Gemini
2.	PCF Code	: 13T
3.	PCF Address	: Kompleks RPH Pulo Gadung, East Jakarta
4.	Owner	: Bpk. Sutarni
5.	Owner's Address	: -
6.	Manager	: Bpk. Radi
7.	Contact number	: 081314008995
8.	Poultry type	: Broiler
9.	PCF size	: 70 m ²
10.	Chicken pen type	: Raised
11.	Pen capacity	: 2000 birds
12.	Number of pens	: 1
13.	Average number of poultry	: 4000 birds
14.	Poultry origin	: Broker
15.	Number of PCF workers	: 7 people
16.	Number of workers in contact with poultry	: 5 people
17.	Average poultry mortality	: 5 birds/day

II. Poultry Management and Waste Management

- PCF located more than 25 metres away from residential housing.
- PCF not fenced.
- Chicken pens do not use litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed every day.
- Pens cleaned by washing.

14. Poultry Collecting Facility 14T

I. General Data

1. PCF Name : Tugiyanto
2. PCF Code : 14T
3. PCF Address : Komplek RPH Pulo Gadung, East Jakarta
4. Owner : Bp. Tugiyanto
5. Owner's Address : -
6. Manager : Bp. Wasno
7. Contact number : 08170135329
8. Poultry type : Broiler
9. PCF size : 300 m²
10. Chicken pen type : Raised
11. Pen capacity : 7000 birds
12. Number of pens : 1
13. Average number of poultry : 8000 birds
14. Poultry origin : Broker
15. Number of PCF workers : 8 people
16. Number of workers in contact with poultry : 7 people
17. Average poultry mortality : 10-20 birds/day

II. Poultry Management and Waste Management

- PCF located more than 25 metres away from residential housing.
- PCF not fenced.
- Chicken pens do not use litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping.

15. Poultry Collecting Facility 15T

I. General Data

1. PCF Name : Handayani II
2. PCF Code : 15T
3. PCF Address : Jl. Pisangan Baru Rt 09/14
Matraman – East Jakarta
No telp 021 8511821
4. Owner : Bp Samiyo Hadi
5. Owner's Address : -
6. Manager : Bp Jimo
7. Contact number : 021 8511821
8. Poultry type : Broiler
9. PCF size : 200 m²
10. Chicken pen type : Raised
11. Pen capacity : 4000 birds
12. Number of pens : 1
13. Average number of poultry : 6000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 13 people
16. Number of workers in contact with poultry : 11 people
17. Average poultry mortality : 2-5 birds/day

II. Poultry Management and Waste Management

- PCF located 15 to 20 metres away from residential housing.
- PCF not fenced.
- Chicken pens do not use litter.
- Poultry manure disposed to garbage site.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping.

16. Poultry Collecting Facility 16T

I. General Data

1. PCF Name : PD Bintang Gumelar
2. PCF Code : 16T
3. PCF Address : Jl. Inspeksi Saluran kalimalang No 1 Rt 08/03,
Kel Cipinang Melayu, Kampung Makassar –
East Jakarta
4. Owner : H Agus
5. Owner's Address : Jl. Inspeksi Saluran kalimalang No 1 Rt 08/03,
Kel Cipinang Melayu, Kampung Makassar –
East Jakarta
6. Manager : H Agus
7. Contact number : 081311113334
8. Poultry type : Broiler
9. PCF size : 140 m²
10. Chicken pen type : Raised
11. Pen capacity : 3500 birds
12. Number of pens : 1
13. Average number of poultry : 3500 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 8 people
16. Number of workers in contact with poultry : 5 people
17. Average poultry mortality : 1-2 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use saw dust as litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed every day.
- Pens cleaned by washing.

17. Poultry Collecting Facility 17T**I. General Data**

1. PCF Name : PD Pareanom
2. PCF Code : 17T
3. PCF Address : Jl. Inspeksi Saluran kalimalang No 1B Rt 08/03, Kel Cipinang Melayu, Kampung Makassar – East Jakarta
No telp 021 8199661, 8574508
4. Owner : Ibu Wibowo
5. Owner's Address : Jl. Inspeksi Saluran kalimalang No 1B Rt 08/03, Kel Cipinang Melayu, Kampung Makassar – East Jakarta
6. Manager : Ibu Wibowo
7. Contact number : 021 8199661, 8574508
8. Poultry type : Broiler
9. PCF size : 140 m²
10. Chicken pen type : Raised
11. Pen capacity : 4500 birds
12. Number of pens : 1
13. Average number of poultry : 6000 birds
14. Poultry origin : Broker
15. Number of PCF workers : 17 people
16. Number of workers in contact with poultry : 16 people
17. Average poultry mortality : 1-2 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use saw dust as liter.
- Poultry manure disposed to garbage site.
- Manure in pens removed every day.
- Pens cleaned by washing.

18. Poultry Collecting Facility 18T

I. General Data

1. PCF Name : Soujana/Yana
2. PCF Code : 18T
3. PCF Address : Jln. Yos Sudarso - Plumpang,
Kec.Tanjung Priok - North Jakarta
(021) 4351578
4. Owner : Bapak. Soujana
5. Owner's Address : Jln. Yos Sudarso - Plumpang,
Kec.Tanjung Priok - North Jakarta
(021) 4351578
6. Manager : Bpk. Atmo
7. Contact number : 08818813186
8. Poultry type : Broiler.
9. PCF size : 1500 m²
10. Chicken pen type : Raised
11. Pen capacity : 2000 birds
12. Number of pens : 2
13. Average number of poultry : 3000 - 4000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 25 people
16. Number of workers in contact with poultry : 21 people
17. Average poultry mortality : < 10 birds/day

II. Poultry Management and Waste Management

- PCF located 5 to 10 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure is sold.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping..



19. Poultry Collecting Facility 19T

I. General Data

1. PCF Name : Ayam Potong 139
2. PCF Code : 19T
3. PCF Address : Jln. Bidara Raya gang HH no.1 Kel.
Pejagalan, North Jakarta
(021) 6604781
4. Owner : Bpk. Arianto
5. Owner's Address : Jln. Bidara Raya gang HH no.1 Kel.
Pejagalan, North Jakarta
(021) 6604781
6. Manager : Bpk. Arianto
7. Contact number : (021) 6604781
8. Poultry type : Native chicken
9. PCF size : 160 m²
10. Chicken pen type : Battery
11. Pen capacity : 5-10 birds
12. Number of pens : 60
13. Average number of poultry : 300 birds
14. Poultry origin : From brokers
15. Number of PCF workers : 13 people
16. Number of workers in contact with poultry : 12 people
17. Average poultry mortality : 0-2 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens do not use litter.
- Poultry manure is sold.
- Manure in pens removed every day.
- Pens cleaned by washing.



20. Poultry Collecting Facility 20T

I. General Data

1. PCF Name : -
2. PCF Code : 20T
3. PCF Address : Pasar Lontar, Jl. Mawar dalam, Kel. Tugu Utara, Kec. Koja – North Jakarta (021) 92647210
4. Owner : Bpk. Slamet
5. Owner's Address : Jl. Mawar dalam, Kel. Tugu Utara, Kec. Koja – North Jakarta (021) 92647210
6. Manager : Bpk. Slamet
7. Contact number : (021) 92647210
8. Poultry type : Broiler
9. PCF size : 15 m²
10. Chicken pen type : Raised/free range
11. Pen capacity : 400 birds
12. Number of pens : 1
13. Average number of poultry : 100 birds
14. Poultry origin : Broker
15. Number of PCF workers : 5 people
16. Number of workers in contact with poultry : 4 people
17. Average poultry mortality : 2 birds/day

II. Poultry Management and Waste Management

- PCF located 5 to 10 metres away from residential housing.
- PCF not fenced.
- Chicken pens do not use litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed every day.
- Pens cleaned by washing.

21. Poultry Collecting Facility 21T

I. General Data

1. PCF Name : PT. Nusa Pangan
2. PCF Code : 21T
3. PCF Address : Jl. Cilincing Raya No. 8 Kec. Cilncing
North Jakarta (021) 4403949
4. Owner : Bpk. Amin Susantio
5. Owner's Address : -
6. Manager : Bpk. Sumarno
7. Contact number : (021) 4403949
8. Poultry type : Broiler
9. PCF size : 500 m²
10. Chicken pen type : Raised
11. Pen capacity : 1500-2000 birds
12. Number of pens : 1
13. Average number of poultry : 1500-2000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 30 people
16. Number of workers in contact with poultry : 20 people
17. Average poultry mortality : < 5 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use litter.
- Poultry manure gathered and sold or sometimes disposed to garbage site.
- Manure in pens removed regularly in less than a week.
- Pens cleaned by sweeping.

22. Poultry Collecting Facility 22T

I. General Data

1. PCF Name : Kandang Bram
2. PCF Code : 22T
3. PCF Address : Jln.Manunggal 7 Rt 05 Rw 15 No. 28A Kel.
Kali Baru Kec. Cilincing – North Jakarta
(021) 449 406 78
4. Owner : Bpk. Bram
5. Owner's Address : Jln.Manunggal 7 Rt 05 Rw 15 No. 28A Kel.
Kali Baru Kec. Cilincing – North Jakarta
(021) 449 406 78
6. Manager : Bpk. Hendra & Tikno
7. Contact number : (021) 449 406 78
8. Poultry type : Broiler
9. PCF size : 200 m²
10. Chicken pen type : Raised
11. Pen capacity : 800 birds
12. Number of pens : 1
13. Average number of poultry : 800 birds
14. Poultry origin : Directly from farm.
15. Number of PCF workers : 5 people
16. Number of workers in contact with poultry : 4 people
17. Average poultry mortality : ± 3 birds/day

II. Poultry Management and Waste Management

- PCF located 5 to 10 metres away from residential housing.
- PCF not fenced.
- Chicken pens use rice hulls as litter.
- Poultry manure disposed to garbage site.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping.

23. Poultry Collecting Facility 23T

I. General Data

1. PCF Name : Cira Jaya
2. PCF Code : 23T
3. PCF Address : Jl. Kalibaru Timur No.31 RT.09/02 Kel.
Kalibaru, Cilincing – North Jakarta.
081315216656
4. Owner : H. Endeng
5. Owner's Address : Bekasi
6. Manager : Bpk. Tatang & Bpk. Heri
7. Contact number : 081315216656
8. Poultry type : Broiler
9. PCF size : 1500 m²
10. Chicken pen type : Raised
11. Pen capacity : 2000-3000 birds
12. Number of pens : 1
13. Average number of poultry : 450 birds
14. Poultry origin : broker
15. Number of PCF workers : 4 people
16. Number of workers in contact with poultry : 3 people
17. Average poultry mortality : 3-4 birds/day

II. Poultry Management and Waste Management

- PCF located 5 to 10 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure put into sacks to be sold.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping and washing.

Poultry Collecting Facility 23T (address moved)**I. General Data**

1. PCF Name : Cira Jaya
2. PCF Code : 23T
3. PCF Address : Jalan Lontar Taman Kel. Tugu Utara, Kec.
Koja North Jakarta
081315216656
4. Owner : H. Endeng
5. Owner's Address : Bekasi
6. Manager : Bpk. Tatang
7. Contact number : 081315216656
8. Poultry type : Broiler
9. PCF size : 1500 m²
10. Chicken pen type : Raised
11. Pen capacity : 2000-3000 birds
12. Number of pens : 1
13. Average number of poultry : 450 birds
14. Poultry origin : broker
15. Number of PCF workers : 4 people
16. Number of workers in contact with poultry : 3 people
17. Average poultry mortality : 3-4 birds/day

II. Poultry Management and Waste Management

- PCF located 5 to 10 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure put into sacks to be sold.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping and washed.

24. Poultry Collecting Facility 24T

I. General Data

1. PCF Name : CV. Batara
2. PCF Code : 24T
3. PCF Address : Kp. Bongkam, Kel. Pademangan Timur
Kec. Pademangan, North Jakarta.
081315077064
4. Owner : Bpk. Adi Tonggeng
5. Owner's Address : Senen, Central Jakarta
6. Manager : Bpk. Suhat
7. Contact number : 081315077064
8. Poultry type : Broiler
9. PCF size : 300 m²
10. Chicken pen type : Raised
11. Pen capacity : 3000 birds
12. Number of pens : 2
13. Average number of poultry : 1920 birds
14. Poultry origin : Broker
15. Number of PCF workers : 4 people
16. Number of workers in contact with poultry : 3 people
17. Average poultry mortality : 3-4 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping.

25. Poultry Collecting Facility 25T

I. General Data

1. PCF Name : UD. Usaha Mandiri
2. PCF Code : 25T
3. PCF Address : Kelurahan Semanan No. 7 RT001/03
Kec. Kalideres West Jakarta
4. Owner : Bapak H. Abbas
5. Owner's Address : Kelurahan Semanan No. 7 RT001/03
Kec. Kalideres West Jakarta
6. Manager : Bapak H. Abbas
7. Contact number : 021-5456846 / 085693675780
8. Poultry type : Male layer
9. PCF size : 300 m²
10. Chicken pen type : Raised
11. Pen capacity : 6000 – 9000 birds
12. Number of pens : 2
13. Average number of poultry : 7000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 25 people
16. Number of workers in contact with poultry : 25 people
17. Average poultry mortality : 10 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens do not use litter.
- Poultry manure collected by farmers.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping.

26. Poultry Collecting Facility 26T

I. General Data

1. PCF Name : H. Koyan
2. PCF Code : 26T
3. PCF Address : Duri Kosambi RT 07/08 Kec. Cengkareng West Jakarta.
4. Owner : H. Koyan
5. Owner's Address : Jl. SD Impres Cengkareng West Jakarta
6. Manager : H. Koyan
7. Contact number : 021-54396574
8. Poultry type : Broiler
9. PCF size : 2300 m²
10. Chicken pen type : Raised
11. Pen capacity : 7000 birds
12. Number of pens : 4 (3 active)
13. Average number of poultry : 6000 birds
14. Poultry origin : Directly from farm and from brokers
15. Number of PCF workers : 15 people
16. Number of workers in contact with poultry : 15 people
17. Average poultry mortality : 20 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure put in sacks and made into fertilizer.
- Manure in pens removed every month.
- Pens cleaned by sweeping.

27. Poultry Collecting Facility 27T

I. General Data

1. PCF Name : Sinar Banten
2. PCF Code : 27T
3. PCF Address : Jl. 20 Desember NO. 90 Taman Surya III
West Jakarta
4. Owner : Ibu Ning
5. Owner's Address :
6. Manager : Ibu Ning
7. Contact number : 021-5445217
8. Poultry type : Broiler
9. PCF size : 1320 m²
10. Chicken pen type : Raised
11. Pen capacity : 10000 -12000 birds
12. Number of pens : 2
13. Average number of poultry : 10000 birds
14. Poultry origin : From broker
15. Number of PCF workers : 30 people
16. Number of workers in contact with poultry : 28 people
17. Average poultry mortality : 10 birds/day

II. Poultry Management and Waste Management

- PCF located 5 to 10 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure sold as fertilizer.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping.

Poultry Collecting Facility 27T (replacement)

I. General Data

1. PCF Name :
2. PCF Code : 27T
3. PCF Address : Jl. Angke Barat RT 16/01 kelurahan Angke
Kec. Tambora
4. Owner : Bapak H. Muslim
5. Owner's Address :
6. Manager : Bapak H. Muslim
7. Contact number : West Jakarta.
8. Poultry type : Male layer
9. PCF size : 400 m²
10. Chicken pen type : Raised
11. Pen capacity : 5000 birds
12. Number of pens : 1
13. Average number of poultry : 4000 birds
14. Poultry origin : Directly from farm and from brokers
15. Number of PCF workers : 15 people
16. Number of workers in contact with poultry : 15 people
17. Average poultry mortality : 3 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF not fenced.
- Chicken pens use rice hulls as litter.
- Poultry manure gathered and made into fertilizer.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping.

28. Poultry Collecting Facility 28T

I. General Data

1. PCF Name : Pangkalan Anggit
2. PCF Code : 28T
3. PCF Address : Jl. Perumahan Duri Kosambi West Jakarta
4. Owner : Bapak Anggit
5. Owner's Address : Jl. Kosambi Timur Raya Perumahan Duri Kosambi Baru
6. Manager : Bapak Anggit
7. Contact number :
8. Poultry type : Male layer
9. PCF size : 400 m²
10. Chicken pen type : Raised
11. Pen capacity : 6000 – 7000 birds
12. Number of pens : 1
13. Average number of poultry : 5000 birds
14. Poultry origin : Directly from farm and from broker
15. Number of PCF workers : 15 people
16. Number of workers in contact with poultry : 15 people
17. Average poultry mortality : 3 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure gathered for fertilizer and feathers recycled.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping.

29. Poultry Collecting Facility 29T

I. General Data

1. PCF Name : Pangkalan Ayam Bang Sarip
2. PCF Code : 29T
3. PCF Address : Jl. Satu maret Desa Maja RT 05/02 Kec. Kalideres West Jakarta
4. Owner : Bapak Sarip / Bapak Herman
5. Owner's Address : Jl. Satu maret Desa Maja RT 05/02 Kec. Kalideres West Jakarta
6. Manager : Bapak Sarip
7. Contact number : 021-5446997
8. Poultry type : Broiler
9. PCF size : 1500 m²
10. Chicken pen type : Raised
11. Pen capacity : 6000 – 10000 birds
12. Number of pens : 1
13. Average number of poultry : 7000 birds
14. Poultry origin : Directly from farm and broker
15. Number of PCF workers : 30 people
16. Number of workers in contact with poultry : 30 people
17. Average poultry mortality : 10 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure gathered in sacks.
- Manure in pens removed once a week.
- Pens cleaned by sweeping.



30. Poultry Collecting Facility 30T

I. General Data

1. PCF Name : Pangkalan Ayam Tumaritis
2. PCF Code : 30T
3. PCF Address : Jl. Bangun Nusa 3 No. 70 A RT 07/02
Kelurahan Cengkareng Timur Kec.
Cengkareng West Jakarta.
4. Owner : Bapak Mindarto
5. Owner's Address : Jl. Bangun Nusa 3 No. 70 A RT 07/02
Kelurahan Cengkareng Timur Kec.
Cengkareng West Jakarta.
6. Manager : Bapak Mindarto
7. Contact number : 08121109379
8. Poultry type : Broiler, spent parent stock
9. PCF size : 950 m²
10. Chicken pen type : Raised
11. Pen capacity : 5000 - 7000 birds
12. Number of pens : 1
13. Average number of poultry : 5000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 18 people
16. Number of workers in contact with poultry : 18 people
17. Average poultry mortality : 5 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF not fenced.
- Chicken pens do not use litter.
- Poultry manure gathered in sacks and made into fertilizer.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping.

31. Poultry Collecting Facility 31T

I. General Data

1. PCF Name : Pangkalan Bapak Waras
2. PCF Code : 31T
3. PCF Address : Jl. Jelambar Utama III No. 22 RT 03/08 West Jakarta
4. Owner : Bpk Waras
5. Owner's Address : Jl. Jelambar Utama III No. 22 RT 03/08 West Jakarta
6. Manager : Bapak Ngadimin
7. Contact number : 021-5686270
8. Poultry type : Male layer
9. PCF size : 450 m²
10. Chicken pen type : Raised
11. Pen capacity : 4000 - 6000 birds
12. Number of pens : 2
13. Average number of poultry : 5000 birds
14. Poultry origin : Directly from farm and from brokers
15. Number of PCF workers : 20 people
16. Number of workers in contact with poultry : 20 people
17. Average poultry mortality : 3 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens do not use litter.
- Poultry manure gathered in sacks and made into fertilizer.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping.

32. Poultry Collecting Facility 32T

I. General Data

1. PCF Name : Sawung Kembar
2. PCF Code : 32T
3. PCF Address : JL. H. Selong RT 01/13 kelurahan Duri Kosambi Kec. Cengkareng West Jakarta.
4. Owner : Bpk. Sutarno
5. Owner's Address : JL. H. Selong RT 01/13 kelurahan Duri Kosambi Kec. Cengkareng West Jakarta.
6. Manager : Bpk. Sutarno
7. Contact number : 0817143785/ 021-68932379
8. Poultry type : Native chicken
9. PCF size : 500 m²
10. Chicken pen type : Board
11. Pen capacity : 1000 birds
12. Number of pens : 2
13. Average number of poultry : 700 birds
14. Poultry origin : From brokers
15. Number of PCF workers : 9 people
16. Number of workers in contact with poultry : 9 people
17. Average poultry mortality : 5 birds/day

II. Poultry Management and Waste Management

- PCF located 5 to 10 metres away from residential housing.
- PCF not fenced.
- Chicken pens do not use litter.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping.

33. Poultry Collecting Facility 33T

I. General Data

1. PCF Name : Kembar Jaya
2. PCF Code : 33T
3. PCF Address : Jl. Penghulu, RT01/01, Cipulir, Kebayoran Lama, South Jakarta
4. Owner : Bapak Siswoyo
5. Owner's Address : Jl. Penghulu, RT11/01, Cipulir, Kebayoran Lama, South Jakarta
6. Manager : Bpk. Ilus
7. Contact number : 08121963642
8. Poultry type : Broiler, spent layer and spent parent stock
9. PCF size : 250 m²
10. Chicken pen type : Raised
11. Pen capacity : 1000 birds
12. Number of pens : 2
13. Average number of poultry : 1500 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 18 people
16. Number of workers in contact with poultry : 15 people
17. Average poultry mortality : 4 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure is sold.
- Manure in pens is removed more than once a week
- Pens cleaned by sweeping.



34. Poultry Collecting Facility 34T

I. General Data

1. PCF Name : Krisma Jaya
2. PCF Code : 34T
3. PCF Address : Jl. Makam No.51 RT 011/0, Cipulir
Kebayoran Lama, South Jakarta
4. Owner : H. Nasiadi
5. Owner's Address : Jl. Makam No.51 RT 011/0, Cipulir
Kebayoran Lama, South Jakarta
6. Manager : H. Nasiadi
7. Contact number : -
8. Poultry type : Broiler and spent layer
9. PCF size : 120 m²
10. Chicken pen type : Raised
11. Pen capacity : 200 birds
12. Number of pens : 2 (1 active)
13. Average number of poultry : 200 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 7 people
16. Number of workers in contact with poultry : 4 people
17. Average poultry mortality : 7 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed every day.
- Pens cleaned by washing.

35. Poultry Collecting Facility 35T

I. General Data

1. PCF Name : Shandy Jaya
2. PCF Code : 35T
3. PCF Address : Jl. Makam No.51 RT 011/0, Cipulir
Kebayoran Lama, South Jakarta
4. Owner : Bpk. Subroto
5. Owner's Address : Jl. Masjid, RT010/01 No. 16A, Cipulir,
Kebayoran Lama, South Jakarta
6. Manager : Fauzin
7. Contact number : -
8. Poultry type : Spent parent stock
9. PCF size : 150 m²
10. Chicken pen type : Raised
11. Pen capacity : 500 birds
12. Number of pens : 1
13. Average number of poultry : 200 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 6 people
16. Number of workers in contact with poultry : 6 people
17. Average poultry mortality : 7 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure is sold.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping.

36. Poultry Collecting Facility 36T

I. General Data

1. PCF Name : Lima P / Bhagus Putra Jaya
2. PCF Code : 36T
3. PCF Address : Jl. Penghulu RT11/01 No. 16 Cipulir, Kebayoran Lama, South Jakarta
4. Owner : Bapak Saroji
5. Owner's Address :
6. Manager : Bapak Saroji
7. Contact number : -
8. Poultry type : Spent layer and parent stock
9. PCF size : 150 m²
10. Chicken pen type : Raised
11. Pen capacity : 500 birds
12. Number of pens : 1
13. Average number of poultry : 1500 birds
14. Poultry origin : Directly from farm and PCFs
15. Number of PCF workers : 6 people
16. Number of workers in contact with poultry : 6 people
17. Average poultry mortality : 3 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens do not use litter.
- Poultry manure gathered and made into fertilizer.
- Manure in pens removed every day.
- Pens cleaned by sweeping and washing.

37. Poultry Collecting Facility 37T

I. General Data

1. PCF Name : Pal Merah
2. PCF Code : 37T
3. PCF Address : Jl. Pluis Kemandoran I
South Jakarta
4. Owner : Bpk. Supriyadi
5. Owner's Address : Jl. Pluis Kemandoran I
South Jakarta
6. Manager : Bpk. Supriyadi
7. Contact number : 021-5495331 / 081574492254
8. Poultry type : Broiler
9. PCF size : 100 m²
10. Chicken pen type : Raised
11. Pen capacity : 3000 birds
12. Number of pens : 2 (1 active)
13. Average number of poultry : 2500 birds
14. Poultry origin : Directly from farm and broker
15. Number of PCF workers : 15 people
16. Number of workers in contact with poultry : 8 people
17. Average poultry mortality : 7 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF not fenced.
- Chicken pens use rice hulls as litter.
- Poultry manure disposed to garbage site and in the public drainage system.
- Manure in pens removed once a week.
- Pens cleaned by sweeping.

38. Poultry Collecting Facility 38T

I. General Data

1. PCF Name : Unggas Jaya
2. PCF Code : 38T
3. PCF Address : Jl. Penghulu Desa Cipulir RT 010/01 Kec. Kebayoran Lama South Jakarta
4. Owner : H. Suli
5. Owner's Address : Jl. Penghulu Desa Cipulir RT 010/01 Kec. Kebayoran Lama South Jakarta
6. Manager : H. Suli
7. Contact number : 081574942641
8. Poultry type : Spent layer and broiler
9. PCF size : 60 m²
10. Chicken pen type : Raised and board
11. Pen capacity : 500 birds
12. Number of pens : 1 (divided into upper and lower pens)
13. Average number of poultry : 500 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 3 people
16. Number of workers in contact with poultry : 3 people
17. Average poultry mortality : 1-3 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use litter.
- Poultry manure disposed to garbage site.
- Manure in pens removed at irregular intervals.
- Pens cleaned by sweeping.

39. Poultry Collecting Facility 39T

I. General Data

1. PCF Name :
2. PCF Code : 39T
3. PCF Address : Jl. Kramat I No. 5, Kebayoran lama, South Jakarta
4. Owner : Bpk Ujang
5. Owner's Address : Jl. Kramat I No.5, Kebayoran Lama, South Jakarta
6. Manager : Bapak Ujang
7. Contact number :
8. Poultry type : Male layer and broiler
9. PCF size : 150 m²
10. Chicken pen type : Raised
11. Pen capacity : 3000 birds
12. Number of pens : 1
13. Average number of poultry : 2000 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 8 people
16. Number of workers in contact with poultry : 8 people
17. Average poultry mortality : 3 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure gathered and made into fertilizer.
- Manure in pens removed every day.
- Pens cleaned by sweeping.

40. Poultry Collecting Facility 40T

I. General Data

1. PCF Name : Putra Jaya Chicken
2. PCF Code : 40T
3. PCF Address : Jl. Kramat I No. 5, Kebayoran lama, South Jakarta
4. Owner : Rudiyanto
5. Owner's Address :
6. Manager : Bpk. Didi
7. Contact number : 085814848659
8. Poultry type : Broiler
9. PCF size : 80 m²
10. Chicken pen type : Raised
11. Pen capacity : 1000 birds
12. Number of pens : 2 (1 active)
13. Average number of poultry : 500 birds
14. Poultry origin : Directly from farm
15. Number of PCF workers : 2 people
16. Number of workers in contact with poultry : 2 people
17. Average poultry mortality : 2-3 birds/day

II. Poultry Management and Waste Management

- PCF located less than 5 metres away from residential housing.
- PCF fenced to prevent birds from leaving the facility.
- Chicken pens use rice hulls as litter.
- Poultry manure is sold.
- Manure in pens removed at irregular intervals.
- Pens cleaned by washing.

Annex 2. Form Questionnaire**Questionnaire for Poultry Collecting Facility (PCF) and
Poultry Transportation in DKI Jakarta**

1. PCF Code :
2. ID :
3. Batch No. :
4. Address, Phone No. :
5. Respondent Name :
6. Owner Name :

I. PCF Questionnaire (for every incoming batch)

1. Check the chickens of every incoming batch. If the origin of the chickens is unknown, then the batch is not sampled (at least until subdistrict level).

Poultry Type	Age (week)	Total (birds)	Origin (farm, village, subdistrict, district, and province)
<input type="checkbox"/> Broiler <input type="checkbox"/> Spent layer <input type="checkbox"/> Male layer <input type="checkbox"/> Spent Parent stock <input type="checkbox"/> Native chicken <input type="checkbox"/> Other, specify.....			

2. Number of chickens deliver to PCF :
 Number of chickens in batch :
 Number of crates in batch :
 Number of chickens per crate :
 3. Batch arrival (date, time) :.....

II. Questionnaire for Poultry Transportation (for driver or transportation manager)

1. Was the vehicle cleaned and disinfected before entering the farm?
 - ☐ Only cleaned
 - ☐ Only disinfected
 - ☐ Cleaned and disinfected
 - ☐ Neither cleaned or disinfected
2. Was the vehicle disinfected when leaving the farm?
 - ☐ Yes
 - ☐ No
3. Chickens came from:
 - ☐ One poultryhouse in one farm
 - ☐ More than one poultryhouse in one farm
 - ☐ More than one farm
 - ☐ Unknown



4. The vehicle is owned by:

☐ Private/Rental

☐ Farm

☐ PCF

☐ Other, specify :.....

5. How many PCFs are visited today?:.....

6. Number of chickens taken from the farm:.....

Enumerator :

Date :

Signature :

Annex 3. Form of Biosecurity Checklist Poultry Facility**BIOSECURITY CHECKLIST
POULTRY COLLECTING FACILITY (PCF)**

Name of PCF Owner / Manager	:	
PCF Code	:	
Address	:	

Directions

Fill in the columns by circling the marks (X) if the corresponding biosecurity statement is found or by checking (✓) the OK column if not.

No.	Biosecurity Statement	Minor	Major	Serious	Critical	OK	Note
I	Location						
1	PCF is located near dense residential area	X					
2	PCF is not located in a flood-free area			X			
II	Building						
1	PCF is dominantly made of material not easily cleaned and disinfected			X			
2	PCF does not have fence to restrict human/animal traffic				X		
3	PCF does not have facilities to disinfect vehicle and human traffic			X			
4	Insufficient toilet facilities	X					
5	Hand washing facilities are unavailable			X			
6	Insufficient clean water supply				X		
7	PCF does not have special area to disinfect equipment and vehicle		X				
8	Does not have an isolation cage				X		
9	PCF does not have a temporary waste storage facility before it is disposed from the PCF		X				
10	No incinerator	X					
11	Poor drainage		X				

No.	Biosecurity Statement	Minor	Major	Serious	Critical	OK	Note
III	Hygiene and Sanitation						
III.1	Environment						
1	The surrounding PCF environment is not sprayed (disinfected)	X					
2	The surrounding PCF environment is not clean	X					
III.2	Equipment						
1	Chicken crate are made of material not easily cleaned and disinfected			X			
2	Vehicles entering the facility are not disinfected			X			
3	Vehicles are not disinfected upon exiting PCF		X				
4	Feeder is made of material not easily cleaned and disinfected			X			
5	Drinking station is made of material not easily cleaned and disinfected			X			
III.3	Personal Hygiene						
III.3.1	Visitor						
1	Access into the PCF complex is not restricted		X				
2	No disinfection upon entering the PCF	X					
3	No disinfection upon exiting the PCF	X					
III.3.2	Worker						
1	Workers in direct contact with poultry are not in healthy conditions			X			
2	Workers having contact with poultry do not maintain personal cleanliness			X			
3	Workers do not use personal protective equipment (facial masks and boots at least)			X			
4	Workers have poor personal hygiene when working			X			
IV	Rearing Management						
IV.1	Rearing System						
1	The health of new chickens are not inspected				X		
2	Do not apply first in first out			X			
3	Rest period is not applied to facility, at least once every 2 weeks		X				
4	Chickens are held at PCFs for more than 1 day			X			
5	There is no pest control (rodent, cat, insect, dog, etc)		X				

No	Biosecurity Statement	Minor	Major	Serious	Critical	OK	Note
IV.2 Waste Management							
1	Chicken manure is not regularly disposed (over once a week)			X			
2	Pen is not regularly cleaned and disinfected (at least every month)		X				
3	Disposal site is insufficient and not closed	X					
4	Solid waste is not treated			X			
5	Dead chickens are not buried or burned		X				
IV.3 Isolation							
1	Sick/dead chickens are not immediately separated from healthy birds				X		
2	Different poultry species are not separated				X		
3	New and old chickens are not separated				X		
TOTAL		8	9	16	7		

Enumerator :

Date :

Signature

()

PCF Biosecurity Checklist Assessment

I. Total Biosecurity Violations				
1	Minor Violations		
2	Major Violations		
3	Serious Violations		
4	Critical Violations		
II. PCF Biosecurity Level				
Category	Total Violations			
	Minor	Major	Serious	Critical
Good	≤4	≤5	<8	0
Moderate	≤6	≤7	≤ 12	≤4
Poor	≤8	≤9	≤ 16	≤7

Assessment Category :

Annex 4. Form of Biosecurity Checklist Poultry Transportation**BIOSECURITY CHECKLIST
POULTRY TRANSPORTATION**

PCF Owner / Manager	:	
PCF Code	:	
Batch No.	:	
ID	:	
Address	:	

Directions

Fill in the columns by circling the marks (X) if the corresponding biosecurity statement is found or by checking (✓) the OK column if not.

No	Biosecurity Statement	Minor	Major	Serious	Critical	OK	Note
I	Transportation Vehicle						
1	Vehicle used not specially designed to transport poultry	X					
2	Vehicle visit more than 1 farm per batch			X			
3	Vehicle doesn't go straight to the PCF when delivering poultry (stops elsewhere on the road)	X					
4	Transporting more than one chicken type in a batch				X		
5	Crate not made of easily cleaned material			X			
6	Vehicle not disinfected when entering PCF		X				
7	Vehicle not disinfected when leaving the PCF				X		
8	Poultry transported are without an animal health certificate		X				
II	Vehicle Sanitation						
1	Vehicle not always cleaned after every batch transportation			X			
2	Vehicle not always disinfected after every batch transportation		X				
3	Crates not always cleaned after every batch transportation			X			
4	Crates not always disinfected after every batch transportation		X				

No	Biosecurity Statement	Minor	Major	Serious	Critical	OK	Note
IV	Personal						
1	Not using personal protective equipment when having contact with chickens	X					
TOTAL		3	4	4	2		

Enumerator :

Date :

Signature

()

Biosecurity Checklist Assessment

I. Total Biosecurity Violations				
1	Minor Violations		
2	Major Violations		
3	Serious Violations		
4	Critical Violations		
II. Poultry Transportation Biosecurity Level				
Category	Total Violations			
	Minor	Major	Serious	Critical
Good	0	≤1	≤2	0
Moderate	≤1	≤3	≤3	≤1
Poor	>1	>3	>3	>1

Assessment Category:

Annex 5. Origin of AI Infected Batch

Province	No	District	Subdistrict	Village	Farm	Batches	PCF
Banten	1	Serang	Cilegon	unknown	Leong ayam 1 Primadona	1B	02
	2		Sukawana	Sukalaksana	unknown	1SL	11
	3		Cikeusal	Cimaung	Cimaung Farm	1B	27
	4	Tangerang	Kresek	Tamiang	ITB Gading	1B	26
	5	Pandeglang	Pandeglang	Saketi		1B	33
Yogyakarta	6	Yogyakarta	Gondamanan	Terban	PasarTerban	1N	04
						2N	05
Central Java	7	Cilacap	Sidareja	unknown	unknown	1N	05
	8	Tegal	Kramat	Kemantran	NUI Farm	1B	17
	9		Balapulang	Kedung Banteng	Sierad Prod Tbk	1B	17
	10	Banyumas	Kembaran	Purbadana	CV HasilSawung	1N	19
	11		Kembaran	Purbadana	unknown	1N	19
	12		Kembaran	unknown	unknown	3N	19
Lampung	13	Banjar Lampung	Rajabasa	unknown	unknown	1B	10
	14	Metro	unknown	Ds 16C	PT Kramat Jaya	1B	14
	15	Lampung Selatan	Tanjung Bintang	unknown	unknown	1B	17
West Java	16	Bekasi	BantarGebang	unknown	NUI Farm	1B	02
	17		BantarGebang	unknown	unknown	1B	18
	18		Setu	unknown	unknown	1B	07
	19		Karawang	unknown	unknown	1B	17
	20	Sukabumi	Cibadak	Tenloyala	Peternakan Male	1B	02
	21		Cicurug	unknown	unknown	1SL	11
	22	Purwakarta	Kiarapedes	Ciracas	Leong Farm	1B	02
	23	Cianjur	Mande	Jamali	Wijaya F	1SL	02
	24		CikalongKulon	unknown	Manggis F	1SL	11
	25	Bogor	Caringin	Caringin		1B	07
	26		Tenjo	unknown	Kandang Ko Ayau	1B	07
	27		Leuwiliang	unknown	unknown	1B	07
	28		Parung	unknown	unknown	1SL	36
	29		GunungSindur	unknown	unknown	1ML	39
	30		Cariu	Cariu	unknown	1B	40
	31	Tasikmalaya	Indihiang	unknown	unknown	1B	20
	32		Indihiang	unknown	unknown	1B	23
	33		Singaparna	unknown	unknown	1B	12
	34		Mangkubumi	unknown	Surya Petra PS	1ML	25
	35	Bandung Barat	Cipatat	unknown	PT. CP	1SP	11
	36	Ciamis	Ciambar	unknown	PT CK	1B	12
	37	Subang	Ciasem	unknown	unknown	1B	12
	38		Compreng	Jatimulya	Subang 4 Farm	1B	13

Annex 6. PCF Biosecurity Assessment

Municipality	PCF Code	PCF Biosecurity	Poultry Transportation Biosecurity			
			Total	Good	Moderate	Poor
Central Jakarta	01 T	Moderate	36	0	29 (80.6%)	7 (19.4%)
	02 T	Moderate	67	0	58 (86.6%)	9 (13.4%)
	03 T	Moderate	40	0	40 (100%)	0
	04 T	Moderate	18	0	18 (100%)	0
	05 T	Moderate	28	0	25 (89.3%)	3 (10.7%)
	06 T	Moderate	28	0	28 (100%)	0
	07 T	Moderate	57	0	57 (100%)	0
	08 T	Moderate	45	0	45 (100%)	0
East Jakarta	09 T	Moderate	32	0	27 (84.4%)	5 (15.6%)
	10 T	Moderate	36	0	25 (69.4%)	11 (30.6%)
	11 T	Moderate	28	0	18 (64.3%)	10 (35.7%)
	12 T	Poor	56	0	56 (100%)	0
	13 T	Moderate	35	0	35 (100%)	0
	14 T	Moderate	56	0	56 (100%)	0
	15 T	Moderate	44	0	44 (100%)	0
	16 T	Moderate	37	0	37 (100%)	0
	17 T	Moderate	66	0	66 (100%)	0
North Jakarta	18 T	Poor	54	0	54 (100%)	0
	19 T	Moderate	24	0	18 (75.0%)	6 (25.0%)
	20 T	Poor	25	0	25 (100%)	0
	21 T	Moderate	25	0	24 (96.0%)	1 (4.0%)
	22 T	Moderate	7	0	7 (100%)	0
	23 T	Moderate	24	0	24 (100%)	0
	24 T	Moderate	13	0	13 (100%)	0
West Jakarta	25 T	Moderate	40	0	37 (92.5%)	3 (7.5%)
	26 T	Poor	57	0	47 (82.5%)	10 (17.5%)
	27 T	Moderate	45	0	25 (55.6%)	20 (44.4%)
	28 T	Moderate	34	0	32 (94.1%)	2 (5.9%)
	29 T	Moderate	87	0	75 (86.2%)	12 (13.8%)
	30 T	Moderate	49	0	49 (100%)	0
	31 T	Moderate	36	0	36 (100%)	0
	32 T	Moderate	23	0	19 (82.6%)	4 (17.4%)
South Jakarta	33 T	Moderate	51	0	49 (96.1%)	2 (3.9%)
	34 T	Moderate	41	0	41 (100%)	0
	35 T	Moderate	15	0	15 (100%)	0
	36 T	Moderate	31	0	31 (100%)	0
	37 T	Moderate	55	0	41 (74.5%)	14 (25.5%)
	38 T	Moderate	25	0	29 (80.0%)	5 (20.0%)
	39 T	Moderate	45	0	45 (100%)	0
	40 T	Moderate	34	0	29 (85.3%)	5 (14.7%)
Total			1549	0	1420 (91.7%)	129 (8.3%)

Annex 7. Biosecurity Violation in PCFs by Category

Category	Biosecurity Violation	N	%
Critical	Does not have an isolation cage	37	92.5
	The health of new chickens are not inspected	37	92.5
	Sick/dead chickens are not immediately separated from healthy birds	12	30.0
	PCF does not have fence to restrict human/animal traffic	8	20.0
	New and old chickens are not separated	7	17.5
	Insufficient clean water supply	2	5.0
	Different poultry species are not separated	1	2.5
Serious	PCF does not have facilities to disinfect vehicle and human traffic	39	97.5
	Workers do not use personal protective equipment (facial masks and boots at least)	39	97.5
	Workers have poor personal hygiene when working	39	97.5
	Vehicles entering the facility are not disinfected	38	95.0
	Solid waste is not treated	32	80.0
	Workers having contact with poultry do not maintain personal cleanliness	27	67.5
	Chickens are held at PCFs for more than 1 day	27	67.5
	Do not apply first in first out	19	47.5
	Chicken manure is not regularly disposed (over once a week)	13	32.5
	Hand washing facilities are unavailable	12	30.0
	Chicken crate are made of material not easily cleaned and disinfected	9	22.5
	PCF is not located in a flood-free area	8	20.0
	PCF is dominantly made of material not easily cleaned and disinfected	8	20.0
	Feeder is made of material not easily cleaned and disinfected	8	20.0
	Drinking station is made of material not easily cleaned and disinfected	1	2.5
	Workers in direct contact with poultry are not in healthy conditions	0	0
Major	Rest period is not applied to facility, at least once every 2 weeks	39	97.5
	Vehicles are not disinfected upon exiting PCF	38	95.0
	PCF does not have special area to disinfect equipment and vehicle	37	92.5
	Dead chickens are not buried or burned	35	87.5
	There is no pest control (rodent, cat, insect, dog, etc)	34	85.0
	Pen is not regularly cleaned and disinfected (at least every month)	26	65.0
	PCF does not have a temporary waste storage facility before it is disposed from the PCF	24	60.0
	Access into the PCF complex is not restricted	24	60.0
	Poor drainage	17	42.5
Minor	No disinfection upon entering the PCF	40	100
	No disinfection upon exiting the PCF	40	100
	No incinerator	37	92.5
	PCF is located near dense residential area	36	90.0
	Disposal site is insufficient and not closed	36	90.0
	The surrounding PCF environment is not sprayed (disinfected)	26	65.0
	The surrounding PCF environment is not clean	12	30.0
	Insufficient toilet facilities	11	27.5

Annex 8. Biosecurity Violation in Poultry Transportation by Category

Category	Biosecurity Violation	N	%
Critical	1. Vehicle not disinfected when leaving the PCF	1529	98.7
	2. Transporting more than one chicken type in a batch	16	1.0
Serious	1. Crates not always cleaned after every batch transportation	1156	74.6
	2. Vehicle not always cleaned after every batch transportation	592	38.2
	3. Crate not made of easily cleaned material	202	13.0
	4. Vehicle visit more than 1 farm per batch	52	3.4
Major	1. Vehicle not disinfected when entering PCF	1543	99.6
	2. Crates not always disinfected after every batch transportation	1543	99.6
	3. Vehicle not always disinfected after every batch transportation	1473	95.1
	4. Poultry transported are without an animal health certificate	929	59.6
Minor	1. Not using personal protective equipment when having contact with chickens	1546	99.8
	2. Vehicle doesn't go straight to the PCF when delivering poultry (stops elsewhere on the road)	106	6.8
	3. Vehicle used not specially designed to transport poultry	17	1.1

Annex 9. Weather data 2009-2010

No	Zone	the commencement of the rainy season	Characteristic of the rain
1	Sumatera	September, October and November 2009	Varied from below normal (BN) to above norma (AN)
2	Jawa	October, November and December 2009	Generally Normal (N) and below Normal (BN)

Source: Badan Meteorologi Klimatologi dan Geofisika



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