



Final Report

A REVIEW OF
FREE RANGE DUCK FARMING SYSTEMS
IN INDONESIA
AND ASSESMENT OF THEIR IMPLICATION
IN THE SPREADING OF
THE HIGHLY PATHOGENIC (H5N1) STRAIN OF
AVIAN INFLUENZA (HPAI)



Center for Indonesian Veterinary Analytical Studies
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It is our wish that this report would offer many benefits as an information source to all the stakeholders involved in the sector, particularly in an effort to implement a better free-range duck farming system in Indonesia.

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Executive Summary

It is well known that the duck is one of the aquatic birds who act as a reservoir for all influenza viruses. Accordingly, free-ranging duck farming system has a high possibility to play an important role in spreading influenza viruses because of the movement of ducks. Based on this, a study on free-range duck farming systems in Indonesia is held by Food and Agriculture Organization of the United Nations (FAO) in the cooperation with Center for Indonesian Veterinary Analytical Studies (CIVAS). This study is part of the whole FAO studies, which are also done in Vietnam. The main objective of the study is to learn more about the free-range duck farming system in Indonesia and to better understand their role in the spreading of HPAI. The study is also to identify additional knowledge gaps that will require investigation and to make preliminary recommendations on practical husbandry related control measures.

The study of free-range duck farming system in Indonesia was done in 5 (five) districts - the locations of the study - namely District of Pemalang and District of Brebes (Province of Central Java), District of Cirebon and District of Subang (Province of West Java) and District of Tangerang (Province of Banten). This study used primary data collected from questionnaires and direct interviews with farmers and district officers. Secondary data were collected from documents provided by the districts, and from literature research (libraries and internet). Total respondents involved in this study were 150 duck farmers (30 farmers in each location of the study).

The result of the study in Indonesia show that 86% of the respondents (129 farmers) adopt free range with additional feed; 15% (10 farmers) adopt free range - scavenging system, and 6% (4 farmers) adopt enclosed free range. Within farming systems commonly adopted in Indonesia, free range - scavenging system is similar to extensive system. Other subsets - free range with additional feed and enclosed free range are categorized as semi-intensive system. Gilbert et. al (2006) state that areas where both extensive and semi-intensive poultry production systems coexist are believed to be particularly at risk in relation to the spreading of HPAI.

Several key risk areas had been identified in the production systems/cycles for possibilities of HPAI transmission. The identification was based on the result of the questionnaires and was also supported by literature study on researches done in other countries. No criteria between high and low risk areas are made because the study did not incorporate any serological tests. Another reason for this is that there is no positive correlation between the results of the questionnaires with HPAI cases occurring in the identified district. Based on the questionnaire results only 4 respondents (2.6% of the respondents) acknowledged that their ducks were infected by Avian Influenza. The main key risk areas in the production systems/cycles explained above were: (1) Movement of duck, (2) Contact with other fowls or animals, (3) Contact with human, (4)

Improper feeding system, (5) Bad sanitation, (6) Improper handling of dead ducks, (7) Improper handling of sick ducks, (8) Improper handling of by-product, (9) Improper handling of farm outputs, and (10) Low farmer's awareness about the disease.

The identification of several key risk areas in the production systems/cycles of free-range duck farming system concluded that free-range duck farming system in Indonesia is likely to spread HPAI viruses. This conclusion needs to be analyzed with further serological studies and other laboratories diagnostic studies in the context of HPAI in ducks. One option in future duck production system is to improve the free-range duck systems in Indonesia and to apply a better biosecurity in semi-intensive system. Besides the 9 (nine) strategies of Avian Influenza prevention stated in the Decree of Director General of Livestock Services No 17/ KPTS/PD.640/02.04 and the associated institutions established under the decree, other legislation and regulations are needed, especially on free-range duck farming system, which are based on the economic and social conditions of Indonesian duck farmers.

Acronym/Abbreviations

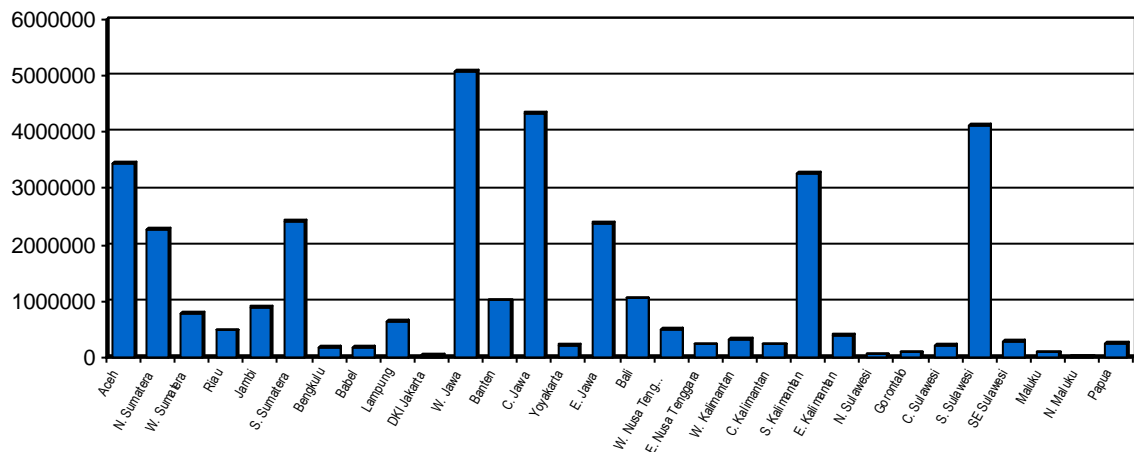
<i>BBPV</i>	<i>Balai Penyidikan Penyakit Hewan</i>
<i>BPPT</i>	<i>Balai Penyidikan Penyakit Ternak</i>
CFR	Case Fatality Rate
DIC	Diseases Investigation Centre
<i>DIY</i>	<i>Daerah Istimewa Yogyakarta</i>
DOD	Day Old Duck
FAO	Food and Agriculture Organization of the United Nations
GPS	Grand Parent Stock
HPAI	Highly Pathogenic of Avian Influenza
kg	kilogram; unit of weight equaling one thousand grams
lbs	pounds; unit of weight equaling 16 oz
m	meter; basic unit of length in the metric system
PS	Parent Stock
<i>UPTD</i>	<i>Unit Pelaksana Teknis Daerah</i> (Regional Technical Implementing Unit)

I. INTRODUCTION

1.1. Overview of Duck Farming Systems and Duck Production Systems in Indonesia

In Indonesia poultry system, ducks are less popular than chicken. Ducks only represent 2.77% of the total poultry population. Duck population in Indonesia fluctuated, from 32,068,244 in 2001 to 46,000,882 in 2002. The population decreased to 33,862,823 in 2003 and to 32,572,780 in 2004, before slightly increasing to 34,275,340 in 2005 (Agricultural Statistics Book, 2005).

Table 1. Duck population by province (2004)



However, ducks still become one of the important poultry commodities both in small-medium scale poultry and commercial poultry because of the high commercial and nutritional advantages they offer. Besides providing income and meat to farmers, ducks also help control insects and weeds in irrigated rice-fields. Table 1 shows that the provinces of West Java, Central Java, South Sulawesi, Aceh and South Kalimantan are areas where ducks are mostly reared.

There are 3 (three) types of duck farming systems adopted in Indonesia: (1) traditional system/scavenging-herding system (extensive system), (2) semi-intensive system, and (3) intensive system. The differences among the three types are given in Table 2 below.

Table 2. Duck farming systems in Indonesia

Characteristics	Extensive	Semi-intensive	Intensive
Rearing system	Free range	Enclosed free range	Cage
Feeding	100% natural feed	50% natural feed and 50% additional feed	100% additional feed
Confinement	Confinements without bodies of water	Enclosed confinements with a body/bodies of water	Individual confinements
Prevention and medication for diseases	No vaccination or medication	Sometimes	Intensive vaccination and medication

Source: Widjaya, K (2004)

The most common system adopted in Indonesia is traditional system (extensive system), where ducks are herded to rice fields or swampy areas and feed on waste paddy, dehulled rice, or small fish and planktons.

In Indonesia, the number of ducks in a flock under the attendance of a single herdsman ranges from 90 to 130. During the day, a flock of ducks, usually mature females, are allowed to search for feed in harvested rice fields and other areas where feed is abundant. At night, the flock is kept in the confinement, usually a bamboo pen, where eggs are laid during the night. Eggs are collected and sold, or consumed by the herdsman's family.

The major part of the diet consists of whole grain and snails, plus small amounts of insects, leaves, crabs and frogs. The herdsman has to move the flock, as often as necessary, to areas where feed is abundant. Portable fencing and other equipment are moved along with the movement to new locations. A grassy area with some protection, e.g. trees, is selected as a base camp where the fencing is set up. Supplementary feed is given to the ducks only when the feed supply in the fields is inadequate.

Petheram and Thahar (1983) stated that the extensive system can be divided into 4 (four) criteria:

1. Fully mobile

Ducks always move following harvest time. Farmers do not have a certain place for living; they build shelters close to the confinements. They also build non permanent, fenced confinements for the ducks. The distance of moving is usually far enough from one area to another, so they have to make use of transportation/vehicles.

2. Semi-mobile

This system is not very much different from the fully mobile system, but the farmers have a certain place for living with their family. When the ducks enter

the molting phase, the farmers go back to their family until the ducks return to lay eggs.

3. Home based

The herding system and the moving of the ducks follow harvest time around their place/village/the farmer's home; the ducks are not moved far from their place. Ducks are allowed to herd around dikes, canals, ponds, around the rice-fields areas, etc. Additional feed, such as 'gaplek', corn, broken rice, or rice bran, is usually given during post harvest time.

4. Opportunist

This system is usually practiced during harvest time, when there are much natural feed. Farmers buy ducks before harvest time, and then sell them when the harvest time is over.

Extensive system has been practiced for generations, almost without variations. One of the characteristics of this system is low production input (production cost) both in supply of feed and the setting up of confinement. It is also necessary to notice, that although the output of this system is relatively lower but the raising time is longer (Suharno and Amri, 1999). Kartika (2003) said that the production output of this system only accounted for 50% of the total number in a given flock.

One weakness of extensive system is that it primarily depends on the season and the harvest time. Not all farmers adopt this system because not all areas in Indonesia have paddy fields. Only in areas with vast paddy fields does this system flourish, such as Tegal, Pemalang, Brebes, Boyolali (Central Java), and Subang and Cirebon (West Java).

Semi intensive system is mainly semi-commercial or commercial, where ducks are kept in an enclosed confinement with a body/bodies of water. In this system, ducks can freely range, rest and swim in ponds in and around the confinement, so they feel like at home. Semi intensive system is commonly adopted by farmers in Indonesia because it suits the characteristics of local ducks. Besides, it offers lower production cost than intensive system does, especially in confinement cost (Kartika, 2003).

In Indonesia, the semi-intensive system is commonly practiced with two variations: namely *free range with additional feed*, and *enclosed free range* (the terms used throughout the report). In the former, ducks are herded to scavenge in ditches, rice fields, canals, etc., kept in an enclosed confinement and given additional feed; or ducks may be kept in enclosed confinement during not at post harvest time around the confinement. In the latter, ducks are not herded outside but can range freely in an enclosed confinement, and fully fed.

Confinement as one of the main characteristics of semi-intensive system usually consists of 2 (two) parts, one for egg-laying place and the other for playing ground (to play or free range). The former has a roof without walls, with

earth floor covered with husk or dried rice stalks, while the latter is a enclosed open area with a small body of water or a pail of water. Sanitation is important as ducks are always kept in the confinement. Cleaning up manure and waste of feed is a must to prevent diseases. Pond or water in pail must also be replaced regularly. If all the above measures are done well, semi-intensive system will be much more advantageous than intensive system.

Samosir (1983) mentioned that one good example of semi-intensive system is the '*lanting*' system practiced in Amuntai (Southern Borneo). Ducks are placed on '*lanting*', stilt confinement on rivers or swampy areas. Feed is made from sago palm or its derivative products, and snails (*kolumbia*).

Intensive system is mainly adopted by commercial farms. Ducks are kept in individual confinements like layer/broiler farming system but without any bodies of water where the ducks can swim or play. There are 3 (three) main points to be noted when adopting this system, which are the making of the confinements, the feeding, and disease prevention (Kartika, 2003). The most common type of confinement is battery confinement. The difference between duck battery confinements with chicken battery confinements is that the former are built higher as ducks are physically taller. The confinements may be two-story ones built in a row. Bamboo or wire is the common material used for the confinements. Feed with high quality are absolutely needed in intensive system to have good outputs both in quality and quantity. Good biosecurity must be applied. Suharno and Amri (1999) stated that duck productivity in intensive system is higher than that in extensive and semi-intensive systems.

Types of ducks are usually classified into three classes, as shown in Table 3 below.

Table 3. General classification of ducks

Type of duck	Breeds	Other Names	Origin	Notes
Egg	1. Indian Runner	Indische Loopend, Indonesian duck	Unknwon	-
	2. Khaki Campbell	-	England	Crossbreed of Wild Mallard, the Rouen and the Indian Runner Duck
	3. Buff (Buff Orpington)	The Buff Orpington	England	-
Meat	1. Pekin	-	China (Tientsien)	-
	2. Aylesbury	-	Aylesbury, England	Derived from Wild Mallard
	3. Rouen	-	-	Derived from Wild Mallard
	4. Muscovy	<i>Entog, Itik Manila</i>	-	Derived from Brazilian Duck
	5. Cayuga	-	-	Derived from Wild Black Duck (<i>Anas Obscura</i>) and common duck
Ornamental / pleasure / hobby	1. East India	-	-	-
	2. Call (Grey Call)	-	-	-
	3. Mandarin	-	-	-
	4. White Crested	-	-	Bred by Profesor Darrel Sheraw in the United States
	5. Blue Swedish	-	-	-

Source: Samosir, DJ (1983)

The Indian Runner is a very active breed, native to Asia, and ideal for free-range. It is a very good egg layer and needs less water than the other breeds, requiring only a basin in which it can immerse its beak up to the nostrils. It is the most graceful and elegant ducks on land with its upright carriage and slim body. It stands at an angle of about 80° to the ground but when startled can be almost perpendicular (FAO technical guide book, 2004). Many experts stated that the original duck of Indonesia is similar to this type (Samosir, 1983).

In relation to production aspect, there are 3 (three) types of commonly raised ducks, namely: (1) layer ducks, (2) meat ducks and (3) breeders (Table 4).

Table 4. Duck breeds commonly reared in Indonesia

Purpose of production	Breeds	Main areas where they are found	System commonly adopted*
Layer Ducks	Alabio Duck (<i>Anas platyrhynchos Borneo</i>)	Amuntai (South Kalimantan)	Semi-intensive and Intensive
	Tegal Duck (<i>Anas javanica</i>)	Tegal (Central Java) Cirebon (West Java) Other areas in Java	Free-range, Semi-intensive and Intensive
	Mojosari Duck	Mojosari (East Java) Other areas in Java	Semi-intensive and Intensive
	Bali Duck (<i>Anas sp</i>)	Bali	Semi-intensive and Intensive
Meat Ducks	Peking Duck	West Java	Semi-intensive and Intensive
	Muscovy Duck	Java	Free-range, Semi-intensive and Intensive
	Tiktok	Sawangan, West Java	Semi-intensive and Intensive
Breeder	Alabio Duck (<i>Anas platyrhynchos Borneo</i>)	Amuntai (South Kalimantan)	Semi-intensive and Intensive
	Tegal Duck (<i>Anas javanica</i>)	Central Java – West Java	Semi-intensive and Intensive
	Mojosari Duck	East Java	Semi-intensive and Intensive
	Bali Duck (<i>Anas sp</i>)	Bali	Semi-intensive and Intensive

Source : Widjaya, K (2004)

*) the system adopted is closely related to the scale of the poultry

The most commonly reared duck in Indonesia is layer duck. However, farmers also sell their ducks after the production period ends (culling ducks). Several well known reared layers in Indonesia are Alabio duck (*Anas platyrhynchos Borneo*), Bali duck (*Anas sp*), Tegal duck (*Anas Javanica*) and Mojosari duck (Samosir, 1983). The performance of such ducks is shown in the Table 5.

Table 5. Performance of layer ducks in Indonesia

Main Breed	Special Traits	Egg production (egg/head/year)	Egg colour
Alabio Duck (<i>Anas platyrhynchos</i> <i>Borneo</i>)	Brown spots on the feather	275	Blue - Gray
Tegal Duck (<i>Anas javanica</i>)	Brown to dark brown feather	250	Green – Blue green
Mojosari Duck	Bright light brown feather	200 – 260	Green – Blue green
Bali Duck (<i>Anas sp</i>)	Little crest on the head White/bright feather	250	White

Source : Widjaya, K (2004); Tanujaya (1992)

The most famous layer is Tegal duck. Tegal duck is originally named after a district in Central Java (the district of Tegal) where it originates, but is commonly reared throughout Java. This duck travels long distances, has a vertical bottle-shaped body with average height ranging from 45 to 50 cm. It has brown or brown-spotted feathers with black beak and feet; some are reddish. (Hardjosworo *in* Hartono, 1998). The eggshell color is green to bluish (Srigandono *in* Tanujaya, 1992).

Another common layer, Mojosari duck, is derived from Tegal duck. Both species belong to one family (Indian runner) with variations on the feathers. Mojosari ducks have smooth brown to dark brown feathers, with light or dark brown spots. Mojosari ducks also have longer neck and legs than Tegal ducks.

Bali duck is almost similar to Java duck, but have a sturdy body and short neck. The body shape is almost vertical, with brightly-colored feathers, and black beak and legs. Among the special traits of Bali duck are the little crest on the head, and white eggshell (Chaves and Lasmini *in* Tanujaya, 1992).

Alabio duck is found in Amuntai, Southern Borneo. This duck is different from Bali or Java duck in the way of walking. Alabio ducks walk at an angle of 45° to the ground. The color of the feathers is similar to that of Tegal duck, with brown spots and beak. The color of the legs is bright orange to yellow. The eggshell is bright blue to greyish (Srigandono *in* Tanujaya, 1992). In intensive system, Tegal ducks can produce 212 eggs/head/year, while Alabio duck can produce 200-250 eggs/head/year (Robinson *in* Tanujaya, 1992).

Meat ducks commonly come from culling layer ducks, which have rubbery meat. In Indonesia, the most common meat ducks are Peking duck, Muscovy duck and 'tiktok' (Kartika, 2003). Although very common as meat duck, the ducks also produce eggs, reaching 100-125 eggs in a year. Therefore they are called dual purpose ducks. "Tiktok" is a cross-bred of male duck (*Anas platyrhynchos*) with female Muscovy duck (*Cairina moschafa*). This cross-bred duck is locally

called *serati*, *beranti*, *togri*, *ritok*, *tongki*, *mandalung* or *pandalungan*. The performance of meat ducks is shown in the Table 6.

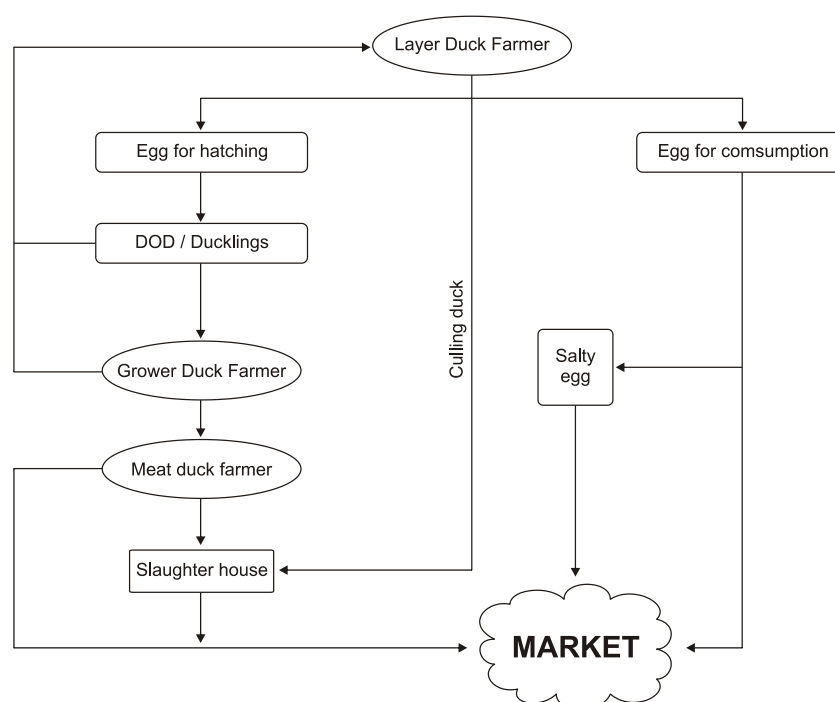
Table 6. Performance of meat ducks in Indonesia

Main Breed	Age when harvested	Body weight / head when harvested
Peking Duck	7 – 9 weeks	2.7 – 3 kg
Muscovy Duck	7 – 9 weeks	3.8 – 4.5 kg
Tiktok	6 – 8 weeks	1.5 – 2 kg

Source : Widjaya, K (2004); *FAO technical guide book* (2004); <http://balitnak.litbang.deptan.go.id>

Breeders are mostly reared as side business in small scale layer or meat duck farms, for self purpose and not for sale. Only big scale or integrated farms have hatcheries for commercial breeders. Figure 1 illustrates duck production system generally adopted in Indonesia in relation to the marketing system

Figure 1. Duck production system generally adopted in Indonesia in relation to the marketing system



Source: Widjaja K, 2004

The by-products of duck farming are feathers and manure. Duck feathers are used for shuttle cock, pillow, mattress or dolls, brooms or jackets. Shuttle cocks need specific features; the feathers should be long, white and smooth. Rough feathers can be used for organic fertilizers or part of fowls feed after being crushed into powder.

Duck manure is commonly used as organic fertilizers for many kinds of plants. Samosir (1983) stated that based on chemistry analysis, one ton of duck manure can give 9.99 kg (22 lbs) nitrogen (N), 13.17 kg (29 lbs) phosphoric acid and 4.54 kg (10 lbs) potassium (K).

1.2. History of HPAI in Indonesia

Avian influenza was firstly known to attack poultry livestocks in Indonesia around July – Agustus 2003, almost along with the occurrences of the plague of this disease in several countries in Asia, including Thailand, Vietnam, South Korea, Japan, Laos, Cambodia and Pakistan.

Initially, avian influenza cases in Indonesia were reported in several commercial poultry farms in West Java and Central Java. Then, the disease spread to various areas in Central Java, West Java, East Java, DIY, Lampung, Bali and several areas in Sumatra and Kalimantan. Various poultry livestocks like commercial broilers and layers including Grand Parent Stock (GPS) and Parent Stock (PS) Poultry Breeder, the duck, muscovy, quail, and dove were known to be attacked by the disease.

Following the first case, avian influenza cases in various parts of Indonesia increased rapidly. During 2003 9 provinces made up of 51 districts were infected, with the number of deaths of the poultry reaching 4.13 million heads (the Indonesian Directorate General of Livestock Services, 2004). At the end of December 2005 the disease had been spread to 24 provinces (155 districts). The number of deaths of the poultry was estimated to reach 10.45 million heads. Apart from the direct loss, the AI plague generated considerable economic loss on the Indonesian poultry livestock sector.

The economic loss in 2003-2004 period covered the 57.9% decline in broiler DOC's demand and 40.4 % in layers'. Poultry feed's demand decreased by 45% and egg supplies by 52.6%. Broiler supplies decreased by 40.75 % and the work opportunity by 39.5% (the FAO Data, 2004).

Clinical, pathological and laboratory studies prove that the cause of the poultry death since 2003 has been Influenza Virus type A, sub-type H5N1. This virus is classified as the highly pathogenic strain of avian influenza virus (HPAI virus), which causes zoonotic diseases. in nature. Initially, AI only attacked poultry but later begins to attack human.

The uniqueness of the AI cases in human in Indonesia was that the cases happened precisely by the time of the cases in poultry had been controlled. Since the first human case in July 2005 in Banten province, this illness has continued to claim casualties. The last report was the 22 deaths in the end of March 2006. The Case Fatality Rate (CFR) in human in Indonesia at this time is the highest in the world reaching 73.3%.

1.3. Avian Influenza Cases in Duck

Since the beginning of the outbreak, most of AI cases in Indonesia have occurred to the chickens. However, until today, official case report in duck livestock has never been released. The Disease Investigation Center, Wates, did carry out several investigations of the AI cases in duck livestock in 6 districts in Java during 2004, in which it examined the cloacal swab samples. The results of the examination can be seen in Table 7 below.

Table 7. Results of the examination of duck cloacal swab samples in six (6) districts in Java

No	District	Number of Farmers	Number of Samples	Test Result
1	Majalengka	1	6	Negative
2	Cirebon	10	30	Negative
3	Pekalongan	3	9	Negative
4	Brebes	16	48	Negative
5	Tasikmalaya	3	9	Negative
6	Ciamis	5	15	Negative

The Disease Investigation Center also carried out an examination of 43 samples taken from various areas in Java in 2004. The results showed that 9 of the 43 samples (21%) were positively infected by AI, 6 (14%) were AI suspects, and 28 (65%) were not infected by AI. The data produced from the examination by Veterinary Inspection Center showed that during 2004 the AI virus started attacking duck livestock.

The absence of reports on clinical cases of AI diseases in duck livestock throughout the year of 2004 did not indicate that there were no AI viruses. The positive results in the sample examination reinforce the statement that ducks are bearer (carrier) of the AI virus.

In 2005, serological studies was carried out in both AI-free regions and endemic regions by all faculties of Veterinary Medicine in Indonesia to find the existence of the AI virus in poultry. The results of the serologic examination of AI disease in duck livestock in several provinces in Indonesia are given in Table 8 below.

Table 8. Results of serology examination of AI in ducks in several provinces in Indonesia

No.	Province	Status in relation to AI occurrence	Number of Samples	Number of Positive Results	Percentage	University
1	Lampung	Endemic	352	157	44.60	Faculty of Veterinary Medicine, Bogor Agricultural University
2	Bengkulu	Endemic	204	17	13.24	
3	South Sumatera	Free & Endemic*	83	3*	3.61	
4	North Sumatera	Endemic	48	5	10.42	
5	West Sumatera	Free & Endemic*	291	2	0.69	
6	Jambi	Free & Endemic*	76	6	7.89	
7	Bangka Belitung	Free & Endemic*	111	30*	27.03	
8	West Kalimantan	Free & Endemic*	208	0	0	
9	Central Kalimantan	Free & Endemic*	36	1*	2.78	
10	South Kalimantan	Free & Endemic	241	18	7.47	
11	East Kalimantan	Free & Endemic	79	0	0	
12	Central Java, East Java, Yogyakarta	Free & Endemic	3779	291	7.7	Faculty of Veterinary Medicine, University of Gajahmada

The data show that duck livestocks in 9 out of 11 provinces in Sumatera and Kalimantan were infected by AI virus with the percentage ranging from 0.69 to 44,6%. The province of the Lampung, which exhibited high percentage of avian influenza occurrence on chicken livestock, also exhibited a similar result on duck livestocks. The data reinforce the assumption that ducks play an important role in spreading AI disease to chicken livestocks in Indonesia.

Serological surveys show that most of the AI-free regions exhibited positive occurrence of AI virus in the duck, except Bangka Island, which is geographically separated by the ocean.

II. RATIONALE OF THE STUDY

It is well known that the duck is one of the aquatics birds which act as a natural reservoir for all influenza viruses. In aquatics birds, influenza viruses replicate predominantly in the intestinal tract and are shed by fecal oral transmission often through water. That is why free range farming systems most probably play an important role in spreading influenza viruses because of the movement of ducks from one area to other areas.

III. OBJECTIVES OF THE STUDY

The main objective of the study is to learn more about free-range duck farming systems in Indonesia and better understand their role in the possible transmission of HPAI. The study is also to identify additional knowledge gaps that will require investigation and make preliminary recommendations on practical husbandry related control measures.

IV. METHODOLOGY

The study bases on four main sources of information as follows:

1. Secondary data from documents provided by the districts.
2. Primary data obtained from interviews with district officers (using questionnaires).
3. Primary data obtained from interviews with farmers (using questionnaires).
4. Literature research (libraries and internet).

4.1. Location of the Study

Several steps were taken to identify the locations of the study, as follows:

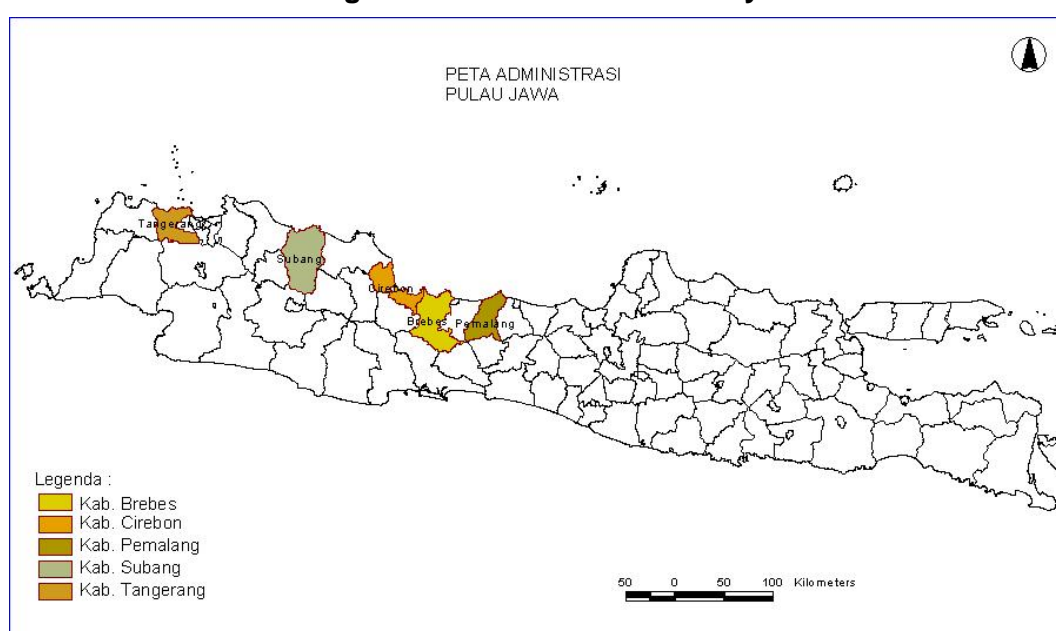
1. Collecting information on major free-range duck areas
2. Determining provinces and districts as the study locations
3. Pre-surveying the districts to collect secondary data
4. Identifying sub-districts to be surveyed based on interviews with district livestock officers.
5. Identifying villages to be surveyed as well as farmers/producers (referred to as 'the respondent') from each sub-district.

Based on the information collected, 5 (five) districts were chosen as the study locations, as shown in Table 9 and Figure 2.

Table 9. Five (5) districts surveyed

No.	Province	District
1.	Banten	Tangerang
2.	West Java	Subang
3.	West Java	Cirebon
4.	Central Java	Brebes
5.	Central Java	Pemalang

Figure 2. Location of the study



Three (3) sub-districts in each district were chosen as the sampling areas, in which 10 farmers ('the respondents') from each sub-district were interviewed. Hence, the total number of farmers interviewed was 30 in each sub-district, making the total 150 respondents in the five districts, a sufficient number to represent free range duck farmers in Indonesia, and to do statistical analysis.

4.2. Organization of the study

The field surveys were done in two steps.

4.2.1. Pre-Survey

The first step of the field survey was interviewing relevant stakeholders in each of the districts by use of Form-A Questionnaire (see Annex 1). The objective

was to describe and assess the relevance of duck production systems in the districts, the importance of various types of duck farming system, and the implementation of disease control measures in the respective district.

The pre-surveys were conducted between the second and the third weeks of January 2006 as show on the table below.

Table 10. Pre-survey schedule

Date of Survey	Location of Survey
January 12, 2006	Tangerang and Brebes
January 13, 2006	Pemalang
January 16, 2006	Cirebon
January 17, 2006	Subang

The questionnaires are written in Indonesian language and were used in interviews during the pre-surveys.

4.2.2. Interviews with Farmers

The second part of the survey was interviewing selected duck farmers at village level. The farmers were selected after discussions with district livestock officers and local people. Form-B questionnaire was used in the interviews (see Annex 2).

The interviews were conducted between the fourth week of January 2006 up to the first week of February 2006, by a team of two 'enumerators' accompanied by one district officer.

The questionnaire used is divided into 5 (five) parts, as follows:

- Part 1 : Farmer's Characteristics
- Part 2 : Farming System
- Part 3 : Production System
- Part 4 : Health management
- Part 5 : Marketing system

V. SCHEDULE OF THE STUDY

Table 11. Schedule of the study

Activity	Dec 2006		Jan 2006				Feb 2006				March 2006	
	Week											
	3	4	1	2	3	4	1	2	3	4	1	2
Drafting questionnaires and searching literatures												
Preparing the field team and collecting information												
Conducting pre survey and testing questionnaires												
Interviewing farmers												
Analyzing data												
Drafting report												
Submitting final report												

VI. RESULTS AND DISCUSSION

6.1. Description of Free Range Duck in the Study Area

6.1.1. General Pictures of the Districts (Questionnaire Survey)

1. Pemalang

The district of Pemalang is made up of 14 sub-districts comprising 222 villages. Topographically, it is divided into two parts: the coastal area (1-13 m above sea level) and the mountainous area (14-914 m above sea level). The questionnaire survey was conducted in three sub-districts, namely Petarukan Sub-district, Taman Sub-district and Randudongkal Sub-district. Petarukan and Taman lie in the coastal area, and Randudongkal in the mountainous area.

Ducks are raised in all the sub-districts of Pemalang, with balanced distribution of duck population between the coastal area and the mountainous area. The total population of ducks recorded in 2005 was 305,710, which represented 15% of the total fowls population in the district.

2. Brebes

The district of Brebes is made up of 17 sub-districts comprising 192 villages and 4 *kelurahan* (an administrative area similar to village and administered by a *Lurah*). It borders on the Sea of Java in the north, the districts of Banyumas and Cilacap in the south, the municipality of Tegal in the east, and the districts of Kuningan and Cirebon in the west. Geographically, it lies on 41° 37.7' - 109° 11' 28.92" East Longitude and 6° 44' 56.5" - 7° 20' 51.48" South Latitude.

Topographically, the land slopes down northward, to the Sea of Java, and can be divided into 3 topographic areas: (1) the lowland, sloping slightly to the sea at the altitude of 3-10 m above sea level; (2) the midland, sloping up and down between the lowland (the north area) and the upland (the south area); and (3) the upland, stretching southward to the border of the districts of Banyumas and Cilacap at the altitude of up to 875 m above sea level.

Brebes is well known for its consumption duck eggs (salty eggs). Based on the secondary data provided by the District (2004), the population of ducks grew from 831,330 (2000) to 847,956 (2001), to 852,196 (2002) and to 874,466 (2003). During 2000-2002 it outnumbered the other fowls. Since 2003, chickens (both broiler and layer) have gained more interests and the population has grown close to that of ducks.

3. Cirebon

The district of Cirebon is made up of 27 sub-districts comprising 424 villages. Like Pemalang and Brebes, the land is divided into coastal area and mountainous area. Most of the population are farmers. It borders on the district of Indramayu in the north, the district of Kuningan in the south, the district of Majalengka in the west, and the district of Brebes in the east.

Cirebon is also well known for its duck eggs. Extensive system used to be adopted in the coastal area. Nowadays, most of the farmers adopt both intensive (cage) and semi-intensive (free range with additional feed and enclosed free range) systems. Most of the farmers form farmer's group. The total population of ducks in 2005 was 274,452.

4. Subang

The district of Subang is made up of 22 sub-districts, comprising 244 villages and 4 *kelurahan*. Geographically, it borders on the Sea of Java in the north, the district of Bandung in the south, the districts of Purwakarta and Karawang in the west, and the districts of Sumedang and Indramayu in the east. Topographically, it is divided into 3 areas, like Brebes, namely (1) the lowland, lying 0-50 meters above sea level and encompassing 92,939.7 hectares (45.15%

of the total district area); (2) the midland, a hilly area stretching at 50-500 meters above sea level and encompassing 71,502 hectares (35.85% of district area); and (3) the upland, stretching at 500-1,500 meters above sea level and encompassing 41,035.09 hectares (20% the total district area).

Although ducks are distributed in all the sub-districts of Subang, most are concentrated in areas with vast rice land. The total population of ducks in 2005 was 485,090.

5. Tangerang

The district of Tangerang is made up of 26 sub-districts comprising 348 villages. It stretches from 105° 1' 11" to 106° 7' 12" East Longitude, and borders on the Sea of Java in the north, the district of Bogor in the south, the district of Serang in the west, and the municipality of Tangerang and the province of DKI Jakarta in the east.

According to the 2003 Agricultural Census, ducks were distributed in all the sub-districts but concentrated mostly in coastal and hilly areas with vast rice land. The total population in 2003 was 714,300, which made up 11% of the total population of chickens (native and commercial chickens).

6.1.2. Results of the Farmer's Questionnaires

86% of the 150 interviewed duck farmers in 5 districts adopt free range with additional feed. Only 10% or 15% adopt free range - scavenging system. 6 farmers (4%) adopt enclosed free range (See Table 12).

Related to the three farming systems mentioned in Chapter One, free range - scavenging system is similar to extensive system, while both free range with additional feed and enclosed free range are classified as semi-intensive system. As Gilbert et al (2006) stated that areas where both extensive and semi-intensive poultry production systems coexist were believed to be particularly at risk in relation to the spreading of HPAI.

Table 12. Farming systems adopted in the five (5) districts

No	Farming System	Frequency (N)	Percentage (%)
1	Free range - scavenging system	15	10
2	Free range with additional feed	129	86
3	Enclosed free-range	6	4
T o t a l		150	100

From the table we see that the majority of the farmers prefer free range with additional feed. All the respondents in the districts of Cirebon and Tangerang adopt this system. In Brebes, 80% of the respondents adopt this system. Only 6 farmers adopt enclosed free range.

In the districts of Pemalang and Subang, 90% and 60% of the respondents adopt free range with additional feed respectively. The survey also found out that 13.3% and 6.7% of the farmers once adopted intensive system; they put their ducks in the colony confinement and fed them everyday. Now only 1 farmer in Subang and 8 farmers in Pemalang adopt free range – scavenging system. Table 13 below gives the farming systems adopted in each district.

Table 13. Farming system by district

No	Duck Feed resource	Pemalang		Brebes		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Free range - scavenging system	8	26.7	6	20	-	-	1	3.3	-	-	15	10
2	Free range with additional feed	18	60	24	24	30	100	27	90	30	100	129	86
3	Enclosed free range	4	13.3	-	-	-	-	2	6.7	-	-	6	4
	TOTAL	30	100	30	100	30	100	30	100	30	100	150	100

1. Characteristics of Respondents/Farmers

Nearly all the respondents are male (142 respondents, 94.7%). It is no surprise as men are the head of family, who are responsible to support the family. Most are in the productive ages (92%), ranging from 20-60 years old. Only 7 are above 60 years old and 5 (3.3%) are below 20 years old.

The education level varies from uneducated up to college level. More than a half (59.3%) only completed elementary school, 12% completed junior high school and 11.3% completed senior high school. Only 2 farmers (1.3%) continued to college while 24 farmers have never had any formal education.

The highest percentage of respondents who have the longest experience in duck farming (>10 years) are those not having formal education and those studying up to elementary school level (66%). It is no surprise as duck farming is the main livelihood and has been practiced for generations.

For 84.7% of the respondents, duck farming is the main business or the main source of income to fulfil all their needs with almost a half of them (42%) also growing rice. A few others have a side job as entrepreneurs in agricultural field, hired paddy field workers, construction workers, traders and civil servants. All the farmers own the duck farms. Some run their farms themselves or hire others to help run the farms.

In general, the characteristics are similar in all the districts. Table 14 below gives the characteristics by district.

Table 14. Respondent's characteristics by district

No	Characteristics	Pemalang		Brebes		Cirebon		Subang		Tangerang		T o t a l	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sex:												
	▪ Male	27	90	29	96.7	27	90	29	96.7	30	100	142	94.7
	▪ Female	3	10	1	3.3	3	10	1	3.3	-	-	8	5.3
	T o t a l	30	100	30	100	30	100	30	100	30	100	30	100
2	Age:												
	▪ < 20 years old	-	-	-	-	-	-	2	6.7	3	10	5	3.3
	▪ 20-60 years old	27	90	27	90	29	96.7	28	93.3	27	90	138	92
	▪ > 60 years old	3	10	3	10	1	3.3	-	-	-	-	7	4.7
	T o t a l	30	100	30	100	30	100	30	100	30	100	30	100
3	Last education level:												
	▪ No formal education	6	20	1	3.3	1	3.3	12	40	4	13.3	24	16
	▪ Elementary school or equivalent	22	73.3	19	63.3	21	70	10	33.3	17	56.7	89	59.3
	▪ Junior high school or equivalent	1	3.3	4	13.3	3	10	3	10	7	23.3	18	12
	▪ Senior high school or equivalent	1	3.3	4	13.3	5	16.7	5	16.7	2	6.7	17	11.3
	▪ College or equivalent	-	-	2	6.7	-	-	-	-	-	-	2	1.3
	T o t a l	30	100	30	100	30	100	30	100	30	100	150	100
4	Experiences in farming:												
	▪ < 1 years	-	-	-	-	-	-	4	13.3	1	3.3	5	3.3
	▪ 1-2 years	-	-	2	6.7	1	3.3	7	23.3	2	6.7	12	8
	▪ 3-5 years	1	3.3	5	16.7	3	10	4	13.3	4	13.3	17	11.3
	▪ 6-10 years	3	10	4	13.3	2	6.7	4	13.3	4	13.3	17	11.3
	▪ > 10 years	26	86.7	19	63.3	24	80	11	36.7	19	63.3	99	66
	T o t a l	30	100	30	100	30	100	30	100	30	100	30	100
5	Type of business:												
	▪ Main	28	93.3	27	90	30	100	24	80	18	60	127	84.7
	▪ Additional	2	6.7	3	10	-	-	6	20	12	40	23	15.3
	T o t a l	30	100	30	100	30	100	30	100	30	100	30	100
6	Other jobs:												
	▪ Entrepreneur	-	-	3	10	2	6.7	2	6.7	1	3.3	8	5.3
	▪ Civil servants / military	2	6.7	-	-	-	-	-	-	-	-	2	1.3
	▪ Private employees	-	-	1	3.3	-	-	-	-	-	-	1	0.7
	▪ Paddy farmers	5	16.7	11	36.7	24	80	11	36.7	12	40	63	42
	▪ Construction workers	-	-	1	3.3	-	-	-	-	-	-	1	0.7
	▪ Others	2	6.7	5	16.7	1	3.3	3	10	13	43.3	24	16
	▪ None	21	70	9	30	3	10	14	46.7	4	13.3	51	34
	T o t a l	30	100	30	100	30	100	30	100	30	100	30	100
7	Ownership:												
	▪ Owner	30	100	30	100	30	100	30	100	30	100	30	100
	T o t a l	30	100	30	100	30	100	30	100	30	100	30	100

No major differences in the characteristics except sex are found in relation to the farming system adopted. Those adopting free range system and free range system with additional feed are male (15 farmers, 100%; 124 farmers, 96.1% respectively). The same proportion of male and female farmers adopts the semi-intensive system.

Here, the majority of the respondents are also in the productive age, have an elementary school level of formal education or never get formal education, and have more than 10 year experiences in duck farming. All the respondents own the duck farms. Some run their farms themselves or hire others to help run the farms. Table 15 below gives the respondents' characteristics by farming system.

Table 15. Respondent's characteristics by farming system

No	Characteristics	Free range - scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Sex :								
	▪ Male	15	100	124	96.1	3	50	142	94.7
	▪ Female	-	-	5	3.9	3	50	8	5.3
	T o t a l	15	100	129	100	6	100	150	100
2	Age :								
	▪ < 20 years old	-	-	5	3.9	-	-	5	3.3
	▪ 20-60 years old	14	73.3	118	91.5	3	50	138	92
	▪ > 60 years old	1	6.7	6	4.7	3	50	7	4.7
	T o t a l	15	100	129	100	6	100	150	100
3	The last education level :								
	▪ No formal education	4	26.7	19	14.7	1	16.7	24	16
	▪ Elementary school or equivalent	9	60	76	58.9	4	66.7	89	59.3
	▪ Junior high school or equivalent	1	6.7	16	12.4	1	16.7	18	12
	▪ Senior high school or equivalent	1	6.7	16	12.4	-	-	17	11.3
	▪ College or equivalent	-	-	2	1.6	-	-	2	1.3
	T o t a l	15	100	129	100	6	100	150	100
4	Experiences in farming :								
	▪ < 1 years	-	-	3	2.3	2	33.3	5	3.3
	▪ 1-2 years	-	-	12	9.3	-	-	12	8
	▪ 3-5 years	3	20	14	10.9	-	-	17	11.3
	▪ 6-10 years	1	6.7	15	11.6	1	16.7	17	11.3
	▪ > 10 years	11	73.3	85	65.9	3	50	99	66
	T o t a l	15	100	129	100	6	100	150	100
5	Type of business :								
	▪ Main	15	100	109	84.5	3	50	127	84.7
	▪ Additional	-	-	20	15.5	3	50	23	15.3
	T o t a l	15	100	129	100	6	100	150	100
6	Other jobs :								
	▪ Entrepreneur	-	-	8	6.2	-	-	8	5.3
	▪ Civil servants / military	-	-	1	0.8	1	16.7	2	1.3
	▪ Private employees	-	-	-	-	-	-	-	-
	▪ Paddy farmers	-	-	1	0.8	-	-	1	0.7
	▪ Construction workers	6	40	55	42.6	2	33.3	63	42
	▪ Others	-	-	1	0.8	-	-	1	0.7
	▪ None	1	6.7	22	17.1	1	16.7	24	16
	T o t a l	8	53.3	41	31.8	2	33.3	51	34
	T o t a l	15	100	129	100	6	100	150	100
7	Ownership :								
	▪ Owner	15	100	129	100	6	100	129	100
	T o t a l	15	100	129	100	6	100	150	100

2. Farming System

A. Kinds, Number and Origin of ducks

Most of the duck reared by the respondents are Javanese ducks (80.7%) with varying number of ducks reared. 65.3% of the respondents own 100-500 ducks; 16.7% own 501-1,000 ducks; and only 6% own more than 1,000 ducks. In general, Javanese ducks is the most preferred one in all the districts, except in the district of Tangerang where the farmers prefer to raise mixed ducks (63.3%). The number of ducks owned by each farmer does not differ greatly among districts. The average number of ducks owned ranges from 100 to 500.

Generally, the farmers buy ducks to raise from other farmers, who also act as middlemen, collectors or brokers, in the village (43.3%), and from other sub-districts or districts, or from other provinces (49.3%). However, 2 farmers in Brebes got the ducks from the breeding farm organized by the district livestock services and the Centre for Livestock Breeding (BPPT).

More than a half of the total respondents rear ducks of the same age (63.3%); the rest rear ducks of different ages (36.7%). The former usually adopt all in – all out system (they rear the ducks until they enter culling period before buying new ones), so there is no variation in the age of the ducks. The former are usually found in the districts of Brebes, Cirebon and Subang. The districts of Pemalang and Tangerang have 53.3% and 63.3% of farmers rearing ducks of different ages respectively. Different ages here consist of three kinds of ducks, namely ducklings, adult ducks/breeders (those entering productive period) and post-productive ducks.

Treatment to ducks of different ages varies with districts, but in general ducks of the same age are kept in the same colony (58.9% of the farmers). In the districts of Tangerang and Subang, most of the farmers (89.5% and 66.7% respectively) mix ducks of different ages in the same colony.

Almost all the respondents (98.7%) have less than 5% of male ducks in each colony. Only one (in the district of Brebes) has more than 5% or more than 10% of male ducks in each colony. Male ducks among female ones in each colony are intended to give a secure feeling to the colony. Besides, as leaders of the colony, male ducks can also stimulate the female's productivity.

Besides ducks, most of the respondents also raise other fowls or mammals around the house, such as muscovy ducks, pigeons, geese, broilers, layers, quails, sheep, goats, buffaloes and cows. Some are kept in cages/confinements, which vary in distance in relation to the ducks confinements. The others mix, eat and play with ducks in the same confinement. Variation in ducks reared by district is given in Table 16.

Table 16. Variation in ducks reared by district

No	Classification	Pemalang		Brebés		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Kind of ducks reared:												
	▪ Javanese	28	93.3	29	96.7	28	93.3	25	83.3	11	36.7	121	80.7
	▪ Mixed	2	6.7	1	3.3	2	6.7	5	16.7	19	63.3	29	19.3
	Total	30	100	30	100	30	100	30	100	30	100	150	100
2	Origin of breeds:												
	▪ Own breeding farm	2	6.7	1	3.3	2	6.7	3	10	-	-	8	5.3
	▪ Other farmers in the village / area	8	26.7	4	13.3	15	50	20	66.7	18	60	65	43.3
	▪ Farmers from other areas	20	66.7	23	76.7	13	43.3	7	23.3	11	36.7	74	49.3
	▪ Market/live market	-	-	-	-	-	-	-	-	1	3.3	1	0.7
	▪ Others	-	-	2	6.7	-	-	-	-	-	-	2	1.3
	Total	30	100	30	100	30	100	30	100	30	100	30	100
3	Number of ownership (heads):												
	▪ < 100	-	-	4	13.3	-	-	4	13.3	10	33.3	18	12
	▪ 100-500	24	80	16	53.3	20	66.7	19	63.3	19	63.3	98	65.3
	▪ 501-1000	5	16.7	8	26.7	6	20	6	20	-	-	25	16.7
	▪ > 1000	1	3.3	2	6.7	4	13.3	1	1	1	3.3	9	6
	Total	30	100	30	100	30	100	30	100	30	100	150	100
4	Variation in duck ages:												
	▪ Same age	14	46.7	20	66.7	23	76.6	27	90	11	36.7	95	63.3
	▪ Different ages	16	53.3	10	33.3	7	23.3	3	10	19	63.3	55	36.7
	Total	30	100	30	100	30	100	30	100	30	100	150	100
5	Treatment to ducks of different ages:												
	▪ Mixed	-	-	3	42.8	-	-	2	66.7	17	89.5	23	41.1
	▪ Separated	16	100	7	57.2	7	100	1	33.3	2	10.5	33	58.9
	Total	16	100	10	100	7	100	3	100	19	100	55	100
6	% male in the colony:												
	▪ < 5 %	30	100	28	93.3	30	100	30	100	30	100	148	98.7
	▪ 5-10 %	-	-	1	3.3	-	-	-	-	-	-	1	0.7
	▪ > 10 %	-	-	1	3.3	-	-	-	-	-	-	1	0.7
	Total	30	100	30	100	30	100	30	100	30	100	150	100

Similar results are obtained among different farming systems adopted. Most of the farmers rear Javanese ducks, own 100-500 heads each, get the ducks from other farmers in the area or other areas, have less than 5% of male ducks in each colony, rear ducks of the same age, and group the ducks by the age.

Table 17. Variation in ducks reared by farming system

No	Classifications	Free range – scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Kind of duck reared:								
	▪ Javanese	15	100	101	78,3	5	83,3	121	80,7
	▪ Mixed	-	-	28	21,7	1	16,7	29	19,3
	Total	15	100	129	100	6	100	150	100
2	Origin of breeds:								
	▪ Own breeding farm	-	-	8	6,2	-	-	8	5,3
	▪ Other farmers in the village / area	2	13,3	61	47,3	2	33,3	65	43,3
	▪ Farmers from other areas	13	86,7	57	44,2	4	66,7	74	49,3
	▪ Market/live market	-	-	1	0,8	-	-	1	0,7
	▪ Others	-	-	2	1,6	-	-	2	1,3
	Total	15	100	129	100	6	100	150	100
3	Number of ownership (heads):								
	▪ < 100	1	6,7	15	11,6	2	33,3	18	12
	▪ 100-500	11	73,3	85	65,9	2	33,3	98	65,3
	▪ 501-1000	3	20	20	15,5	2	33,3	25	16,7
	▪ > 1000	-	-	9	7	-	-	9	6
	Total	15	100	129	100	6	100	150	100
4	Variation in duck age:								
	▪ Same age	12	80	80	62	3	50	95	63,3
	▪ Different ages	3	20	49	38	3	50	55	36,7
	Total	15	100	129	100	6	100	150	100
5	Treatment to ducks of different ages:								
	▪ Mixed	1	33,3	21	42,8	-	-	22	40
	▪ Separated	2	66,7	28	57,2	3	100	33	60
	Total	3	100	49	100	3	100	55	100
6	% male in the colony:								
	▪ < 5 %	15	100	127	98,4	6	100	148	98,7
	▪ 5-10 %	-	-	1	0,8	-	-	1	0,7
	▪ > 10 %	-	-	1	0,8	-	-	1	0,7
	Total	15	100	129	100	6	100	150	100

B. Herding System (Free-Range System)

The most common herding system adopted by most of the farmers (61.8%) is harvested rice-running herding system. The herding system is closely related to how the respondents get the feed (sources of duck feed).

Most of the respondents herd the ducks everyday, from 6-7 a.m. to 5-6 p.m. The only variation among the districts is the distance the ducks are herded. The distance is primarily dictated by the availability of natural feed after harvest in each district.

In the districts of Pemalang and Subang, 46.2% and 39.3% of the farmers respectively herd around within the district, while in the district of Brebes 40.0% herd across the district but still within the province. 40.0% of the farmers in the district of Cirebon herd across the province, while 70.0% of the farmers in the district of Tangerang only herd within the village.

The way the ducks are herded depends on the distance. In Pemalang and Subang, where the ducks are herded a long way, most of the farmers transport the ducks in truck. In Tangerang, where the ducks are herded within the village, 76.7% of the farmers drive the ducks around the village.

The long-travelling ducks are not usually mingled with other fowls or mammals. On a few occasions, the ducks scavenge with local chickens, or water buffaloes ploughing the field.

Most of the farmers say they do not need to pay for nor rent the herding areas. Usually, they only give 1-2 eggs to the owner of the herding areas for using their post-harvest paddy-fields. Some respondents give the eggs once in 2 days; others once in 3 days, or once in a week, depending on the ducks productivity. Only a few give money, ranging from Rp10,000 to Rp50,000 (see Table 18).

Table 18. Herding system by district

No	Classifications	Pemalang		Brebès		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Time of herding:												
	▪ All seasons, depending on paddy-rice cycle / harvest time	9	34.6	12	40	17	56.7	10	35.7	-	-	48	33.3
	▪ All seasons, not depending on paddy-rice cycle	-	-	-	-	-	-	5	17.9	-	-	5	3.5
	▪ Depending on paddy-rice cycle, not all seasons	17	65.4	16	53.3	13	43.3	13	46.4	30	100	89	61.8
	▪ Depending on season / weather	-	-	2	6.7	-	-	-	-	-	-	2	1.4
	Total	26	100	30	100	30	100	28	100	30	100	144	100
2	Frequency of herding :												
	▪ Every day	25	96.2	27	90	29	96.7	22	78.6	30	100	133	92.4
	▪ Once in 2 days	-	-	2	6.7	-	-	-	-	-	-	2	1.4
	▪ Irregular	1	3.8	1	3.3	1	3.3	6	21.4	-	-	9	6.3
	Total	26	100	30	100	30	100	28	100	30	100	144	100
3	Start of herding :												
	▪ 06.00 am – 07.00 am	15	57.6	9	30	22	73.3	22	78.6	21	70	89	61.8
	▪ 8.00 am – 09.00 am	11	42.4	21	70	8	26.7	6	21.4	9	30	55	38.2
	Total	26	100	30	100	30	100	28	100	30	100	144	100
4	End of herding :												
	▪ 12.00 am	-	-	2	6.7	-	-	-	-	-	-	2	1.4
	▪ 03.00 pm – 04.00 pm	10	38.5	22	73.3	17	56.7	15	53.6	8	26.7	72	50
	▪ 05.00 pm – 06.00 pm	16	61.5	6	20	13	43.3	13	46.4	22	73.3	70	48.6
	Total	26	100	30	100	30	100	28	100	30	100	144	100
5	Movement distance:												
	▪ Moving within 1 village	-	-	2	6.7	-	-	4	14.3	21	70	27	18.8
	▪ Moving within 1 sub-district	9	34.6	10	33.3	9	30	5	17.9	7	23.3	40	27.8
	▪ Moving within 1 district	12	46.2	2	6.7	4	13.3	11	39.3	2	6.7	31	21.5
	▪ Moving within 1 province	4	15.4	12	40	5	16.7	6	21.4	-	-	27	18.8
	▪ Moving across the province	1	3.8	4	13.3	12	40	2	7.1	-	-	19	13.2
	Total	26	100	30	100	30	100	28	100	30	100	144	100
6	Way of movement:												
	▪ By truck	21	80.8	16	53.3	12	40	12	42.9	2	6.7	63	43.8
	▪ Herding the duck	1	3.8	3	10	-	-	4	14.3	23	76.7	31	21.5
	▪ Mixed	4	15.4	11	36.7	18	60	12	42.9	5	16.7	50	34.7
	Total	26	100	30	100	30	100	28	100	30	100	144	100
7	Compensation for the use of the herding areas:												
	▪ Money	-	-	2	6.7	3	10	2	7.1	-	-	7	4.9
	▪ Eggs	26	100	28	93.3	27	90	26	92.9	30	100	137	95.1
	Total	26	100	30	100	30	100	28	100	30	100	144	100

Based on the result of the survey (Table 19), all the farmers adopting free range scavenging system (15 respondents, 100%) do the activity in all seasons, not depending on the weather. They herd the ducks every day, mostly (66.7%) starting at 08.00 – 09.00 a.m. after collecting the eggs. They usually finish at 03.00 – 04.00 p.m. (80%). They move around seeking post harvest paddy-field areas and do not depend on seasons. None of them move within the village. Due to its characteristics, free range - scavenging system involve long-distance movement. A large part of the farmers (46.7%) move across the district within one province. Others even move across the province (13.3%). A small number of the farmers move within the sub-district (6.7%) and others within the district (33.3%). More than half of the farmers (60%) transport the ducks on trucks as

they go a long way. Prior to the movement, one or two farmers survey the new target area. If the area is found to be suitable, 1-4 farmers collect money and rent a truck or other vehicles to transport the ducks and all the necessary tools/equipment.

Farmers adopting free range system with additional feed do the activity depending on cycles. The highest percentage (69%, 89 out of 129 respondents) follows paddy-rice cycles but does not depend on seasons. They depend primarily on the weather and the presence of post harvest paddy-fields around their houses. When the weather is too hot or rainy, or when the planting season has started, then the ducks are put in confinements with or without a yard, and are fully fed. In such a case, the farmers do not move very far, only within the district. Two other farmers (1.6%) say that the herding depends on the weather. In unfavourable weather conditions (too hot or rainy) they put the ducks in confinements and feed them although there are post harvest areas around. They do not move very far, only within the village.

Farmers adopting all season and harvested rice-running herding systems represent 26.4% of 129 farmers. Those adopting all season herding system and not depending on paddy-rice cycle represent 3.1% of 129 respondents. Both types of farmers have some things in common: they herd the ducks both in the dry and the wet seasons. Generally, they have determined in advance how far they will herd because they have previously decided to give additional feed. They, however, differ in choosing the herding place. While the former herd in post harvest areas only, the latter herd along the riverbanks or abandoned ponds when the harvested areas run out of feed, without any fixed frequency and length of herding time.

In fact, none of the farmers adopting free range system with additional feed are restricted to a certain system and fixed herding time. They usually mix or try to compare various herding times to suit their condition. Some farmers tend to apply free-range scavenging system because they want to cut down expenses for the feed and because the topography supports such a system (the presence of paddy field areas).

Strictly speaking of the feeding pattern, there are no absolute way of movement and way to get the herding areas in all the districts. The only thing that does matter is the distance because it determines whether or not the farmers need to use trucks or other means of transportation. Table 19 below compares the herding systems by farming system.

Table 19. Herding system by farming system

No	Classifications	Free range - scavenging system		Free range with additional feed		Total	
		N	%	N	%	N	%
1	Time of herding : ▪ All seasons, depending on paddy-rice cycle / harvest time ▪ All seasons, not depending on paddy-rice cycle ▪ Depending on paddy-rice cycle, not all seasons ▪ Depending on season / the weather	15 - - -	100 - - -	34 4 89 2	26.4 3.1 69 1.6	49 4 89 2	34 2.8 61.8 1.4
	T o t a l	15	100	129	100	144	100
2	Frequency of herding: ▪ Everyday ▪ Once in 2 days ▪ Irregular	15 - -	100 - -	118 2 9	91.5 1.6 7	133 2 9	92.4 1.4 6.3
	T o t a l	15	100	129	100	144	100
3	Start of herding: ▪ 06.00 am – 07.00 am ▪ 8.00 am – 09.00 am	5 10	33.4 66.7	84 45	65.1 34.9	89 55	59.4 36.7
	T o t a l	15	100	129	100	144	96
4	End of herding: ▪ 12.00 am ▪ 03.00 pm – 04.00 pm ▪ 05.00 pm – 06.00 pm	- 12 3	- 80 20	2 60 67	1.6 46.5 52.9	6 74 70	4 49.3 46.7
	T o t a l	15	100	129	100	144	96
5	Movement distance: ▪ Moving within 1 village ▪ Moving within 1 sub-district ▪ Moving within 1 district ▪ Moving within 1 province ▪ Moving across the province	- 1 5 7 2	- 6.7 33.3 46.7 13.3	27 39 26 20 17	20.9 30.2 20.2 15.5 13.2	27 40 31 27 19	18.8 27.8 21.5 10.8 3.2
	T o t a l	15	100	129	100	144	100
6	Way of movement: ▪ By truck ▪ Herding the ducks ▪ Mixed	9 2 4	60 13.3 26.7	54 29 46	41.9 22.5 35.7	63 31 50	43.8 21.5 34.7
	T o t a l	15	100	129	100	144	100
7	Compensation for the use of the herding areas: ▪ Rent (pay some money) ▪ Not rent (give eggs)	2 13	13.3 86.7	5 124	3.9 96.1	7 137	4.9 95.1
	T o t a l	15	100	129	100	144	100

The herding areas vary with the topography. Table 20 below shows various herding areas and the feed found in each area. As any farmer interviewed might mention more than one herding areas and kind of feed found, the cumulative number of the answers does not necessarily represent the cumulative number of respondents.

Coastal areas were once the favorite herding areas in the coastal district of Cirebon. The local farmers say that only few farmers still herd in coastal areas. They now prefer putting their ducks in confinements and give them fishes, which are abundant in the area, as additional feed. Table 20 also shows that free-range ducks or scavenging ducks are an important biological control of golden snails, one of the paddy-field pests. Other types of feed found are insects and crustaceans.

Table 20. Herding areas and the feed found

No	Classifications	Pemalang	Brebes	Cirebon	Subang	Tangerang	T o t a l
		(N)	(N)	(N)	(N)	(N)	(N)
1	Herding areas:						
	▪ Rice-field	26	29	30	28	30	143
	▪ Beach / coastal areas	-	-	11	-	-	11
	▪ Riverbanks	5	1	30	13	1	50
	▪ Abandoned ponds	1	-	15	2	-	18
2	▪ Canals / irrigation ditches	6	3	24	7	2	42
	Feed found in the area:						
	▪ Waste of harvest rice	23	24	30	15	20	111
	▪ Dehulled rice	26	25	28	18	29	126
	▪ Golden snails	11	3	2	10	27	137
	▪ Black snails	4	5	3	3	-	53
	▪ Little fishes	7	19	26	26	28	80
	▪ Worms	21	27	27	12	25	112

C. Additional Feed

Most of the farmers (135 out of 150 total respondents) give additional feed to their ducks. 53.3% (72 out of 135 respondents) give additional feed when the ducks are less than 10 weeks old. 46 respondents (43.1%) give additional feed when the ducks are 21-30 weeks old, or when the ducks enter production period (laying eggs). 12.6% of the respondents give additional feed when the ducks are 10-20 weeks old. The difference in the age depends on when the ducks are bought or reared. The frequency of the feeding also varies with the length of herding time, the availability of herding areas, or the weather conditions. When the weather is unfavorable, or when there are no longer post harvest rice-field areas, the farmers put the ducks in confinements and intensify the feeding (2-3 times per day).

Table 21. Additional feed and frequency of feeding by district

No	Classifications	Pemalang		Brebes		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Age when first given additional feed:												
	▪ < 10 weeks	11	50	23	95.8	13	43.3	21	72.4	4	13.3	72	53.3
	▪ 10-20 weeks	-	-	-	-	10	33.3	5	17.2	2	6.7	17	12.6
	▪ 21-30 weeks	11	50	1	4.2	7	23.3	3	10.3	24	80	46	34.1
	Total	22	100	24	100	30	100	29	100	30	100	135	100
2	Frequency:												
	▪ Once	2	9.1	5	20.8	-	-	1	3.4	-	-	8	5.9
	▪ Twice	9	40.9	6	25	14	46.7	19	65.5	10	33.3	58	43
	▪ 3 times	11	50	13	54.2	16	53.3	9	31	20	66.7	69	51.1
	Total	22	100	24	100	30	100	29	100	30	100	135	100

Table 22 gives additional feed and frequency of feeding by farming system. No significant differences are found in each district. Most of the farmers give additional feed twice or 3 times a day.

Table 22. Additional feed and frequency of feeding by farming system

No	Classifications	Free range with additional feed		Enclosed free range (fully feeding)		Total	
		N	%	N	%	N	%
1	Age when first given additional feed:						
	▪ < 10 weeks	68	52.7	4	66.7	72	53.3
	▪ 10-20 weeks	15	11.6	2	33.3	17	12.6
	▪ 21-30 weeks	46	35.7	-	-	46	34.1
	Total	129	100	6	100	135	100
2	Frequency:						
	▪ Once	7	5.4	-	-	7	5.2
	▪ Twice	57	44.2	2	33.3	59	43.7
	▪ 3 times	65	50.4	4	66.7	69	51.1
	Total	129	100	6	100	135	100

Additional feed given in each district varies with local resources. Ducks raised in coastal areas are fed by high protein feed such as fish (and waste fish), as they are cheap or free, and abundant. Those raised far from the beach are mostly fed by household and restaurant cooking waste. Table 23 below gives the kinds of additional feed usually given in each district.

Table 23. Kinds of additional feed by district

No	Kind of feed	Pemalang	Brebes	Cirebon	Subang	Tangerang	Total
		(N)	(N)	(N)	(N)	(N)	(N)
1	Concentrate / factory feed	6	14	4	1	-	25
2	Waste fish	17	17	20	2	23	79
3	Household and restaurant cooking waste	21	9	1	1	-	32
4	Crop residue	3	10	9	16	-	38
5	Hand made feed / mixed	-	-	12	1	-	13

Kinds of additional feed by farming system are the same in free range system with additional feed and enclosed free range (see Table 24). Factory feed contains high contents of fiber as a source of energy. Farmers mix it with bran to cut down expenses. Aquatic animals are given as a source of high protein. The most common one is copped or blended fishes given at midday (on 3-time feeding a day).

Shells of crustaceans (shell-fish) are given as a source of calcium. Shells of crustaceans are mixed with concentrate and other cooking waste such as dried rice (*Loyang*) and given twice a day, in the morning and or in the afternoon. In lowland area close to arable land/non-irrigated land or plantation area, the most common additional feed consists of crop residue (chopped corn bump or waste of wheat-hulling).

Table 24. Kinds of additional feed by farming system

No	Kinds of feed	Free range with additional feed	Enclosed free range
		(N)	(N)
1	Concentrate / factory feed	22	3
2	Waste fish	74	5
3	Household and restaurant cooking waste	27	5
4	Crop residue	36	2
5	Hand made feed / mixed	13	-

D. Confinement System

All the respondents (100%, 150 respondents) say that they build confinements for their ducks. 70% of the farmers build non-permanent confinements; the rest build permanent confinements. In both types of confinements 67.3% the farmers (101 of 150 respondents) keep 10 heads per square meter; others less than 10 heads/m². Eight farmers (5.3%) keep 21-30 heads/m², and only 2 respondents keep more than 30 heads/m² (Table 25).

Table 25. Confinement system by district

No	Classifications	Pemalang		Brebes		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Types of confinement:												
	▪ Permanent	17	56.7	9	30	14	46.7	3	10	2	6.7	45	30
	▪ Non-permanent	13	43.3	21	70	16	53.3	27	90	28	93.3	105	70
	Total	30	100	30	100	30	100	30	100	30	100	150	100
2	Kinds of permanent confinement :												
	▪ Roof without walls, with a yard, pond / water area, fence	-	-	4	44.4	9	64.3	-	-	-	-	13	28.9
	▪ Colony confinement with a yard, water area and fence	12	70.6	2	22.2	5	35.7	2	66.7	1	50	22	48.9
	▪ Colony confinement	5	29.4	3	33.3	-	-	1	33.3	1	50	10	22.2
	Total	17	100	9	100	14	100	3	100	2	100	45	100
3	Waste management in non-permanent confinement:												
	▪ Cleaned up	-	-	-	-	2	12.5	1	3.7	9	32.1	12	11.4
	▪ Re-used for new confinement	13	100	21	21	14	87.5	26	96.3	19	67.9	93	88.6
	Total	13	100	21	100	16	100	27	100	28	100	105	100
4	Duck density:												
	▪ < 10 / m ²												
	▪ 10-20 / m ²	23	76.7	17	56.7	22	73.3	9	30	30	100	101	67.3
	▪ 21-30 m ²	6	20	9	30	7	23.3	16	53.3	-	-	38	25.3
	▪ > 30 / m ²	1	3.3	4	13.3	1	3.3	2	6.7	-	-	8	5.3
	Total	30	100	30	100	30	100	30	100	30	100	150	100

Table 26 gives confinement system by farming system. 15 farmers adopting free range system build non-permanent confinements. 90 of the 129 respondents adopting free range system with additional feed (69.8%) build non-permanent confinements and the rest build permanent confinements. Farmers adopting enclosed free range (100%, 6 respondents) build permanent confinements.

Table 26. Confinement system by farming system

No	Classifications	Free range – scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Types of confinement:								
	▪ Permanent	-	-	39	30.2	6	100	45	30
	▪ Non-permanent	15	100	90	69.8	-	-	105	70
	Total	15	100	129	100	6	100	150	10
2	Kinds of permanent confinement:								
	▪ Roof without walls, with a yard, pond / water area, fence	-	-	13	33.3	-	-	13	28.9
	▪ Colony confinement with a yard, water area and fence	-	-	19	48.7	3	50	22	48.9
	▪ Colony confinement	-	-	7	17.9	3	50	10	22.2
	Total	-	-	39	100	6	100	45	100
3	Waste management in non-permanent confinement:								
	▪ Cleaned up	-	-	12	13.3	-	-	12	11.4
	▪ Re-used for new confinement	15	100	78	86.7	-	-	93	88.6
	Total	15	100	90	100	-	-	105	100
4	Duck density:								
	▪ < 10 / m ²	4	26.7	92	71.3	5	83.3	101	67.3
	▪ 10-20 / m ²	9	60	28	21.7	1	16.7	38	25.3
	▪ 21-30 m ²	2	13.3	6	4.7	-	-	8	5.3
	▪ > 30 / m ²	-	-	3	2.3	-	-	3	2
	Total	15	100	129	100	6	100	150	100

Non-permanent confinements are usually made from local materials such as bamboo for the frame; and tarpaulin or plastic bags for walls or roofs. Several farmers make the walls out of plastic nets. Non-permanent confinements are usually colony confinements with the floor covered by chaff or dried rice stalks. They have no fence nor a yard or pond inside. Non-permanent confinements are commonly built by farmers adopting free range system or free range system with additional feed.

In free range system, non-permanent confinements are built in the herding areas, commonly around post harvest paddy-field areas where the ducks scavenge. Usually, farmers build confinements next to other farmers, separated by bamboo or plastic bag fence. Farmers also build non-permanent shelters near their confinements. The confinements and all the other tools/equipment are brought along as they move new herding areas and re-built.

Similarly, farmers adopting free range system with additional feed re-build the confinements in the new herding areas. Only 12 say they build new confinements in the new herding areas.

Permanent or semi-permanent confinements are usually built by farmers adopting enclosed free range, and a few adopting free range with additional feed. The construction varies with the topography and the farmer's economic resources. The frame is usually made from bamboo and the roof is made from isthmus. The confinements do not have walls, but have 1-meter fence to separate a group of ducks from each other.

The farmers usually provide an open area or a yard as free range area for duck to play. The confinements are also furnished with little ponds, ditches or pails of water. In case of limited area, the farmers build colony confinements similar to non-permanent ones (bamboo frame, tarpaulin or plastic bag roofs and walls).

The questionnaire survey shows that farmers adopting free range system with additional feed and those adopting enclosed free range usually keep less than 10 heads per square meter of confinement. Farmers adopting free range system keep the ducks in colony confinements with the density of 10-20 heads/m².

E. Labour Input

The majority of the farmers (56.7%, 85 out of 150 respondents) take care of their ducks by themselves. 49 farmers (32.7%) ask their family (including the children and the wives) for help. Others hire their neighbors (8.0%) and people from outside the village (2.7%) to herd the ducks, clean the confinements or prepare the feed. Some of these workers stay around the herding areas; the others in their own houses. The average number of workers in a duck farm surveyed is 1-3 persons (98.0%), including the owner. Some workers stay overnight around the herding area, the others live at their own home.

As the neighbors and the outsiders are not part of the family, the owners have to pay them well. Only 13.3% of the respondents pay their workers because the rest take care of the ducks with their family. The amount of wage given to workers varies with the tasks. Those responsible for the whole farm (herding the ducks, cleaning the confinements and preparing the feed) get around Rp500,000 per month. Those responsible for feed preparation only (chopping fishes or corn bump) get daily wage of Rp4,000 (see Table 27).

Table 27. Labour input system by district

No	Classifications	Pemalang		Brebés		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Workers												
	▪ The owners	21	70	22	73.3	11	36.7	14	46.7	17	56.7	85	56.7
	▪ Families	4	13.3	4	13.3	12	40	16	53.3	13	43.3	49	32.7
	▪ Neighbors	5	16.7	-	-	7	23.3	-	-	-	-	12	8
	▪ Outsiders	-	-	4	13.3	-	-	-	-	-	-	4	2.7
	Total	30	100	30	100	30	100	30	100	30	100	150	100
2	Number of workers :												
	▪ 1-3 persons	29	96.7	30	100	30	100	30	100	28	93.3	147	98
	▪ 4-10 persons	1	3.3	-	-	-	-	-	-	1	3.3	2	1.3
	▪ > 10 persons	-	-	-	-	-	-	-	-	1	3.3	1	0.7
	Total	30	100	30	100	30	100	30	100	30	100	150	100
3	Wage system:												
	▪ Yes	5	16.7	5	16.7	9	30	1	3.3	-	-	20	13.3
	▪ No	25	83.3	25	83.3	21	70	29	96.7	30	100	130	86.7
	Total	30	100	30	100	30	100	30	100	30	100	150	100

No differences are observed in labour systems by farming system in each district. The majority of the workers are the owners and their families, with average number of workers ranging from 1 to 3 persons. And there is no wage system for self or family-run farms (Table 28).

Table 28. Labour input system by farming system

No	Classifications	Free range - scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Workers								
	▪ The owners	13	86.7	71	55	1	16.7	85	56.7
	▪ Families	2	13.3	43	33.3	4	66.7	49	32.7
	▪ Neighbors	-	-	11	8.5	1	16.7	12	8.0
	▪ Outsiders	-	-	4	3.1	-	-	4	2.7
	Total	15	100	129	100	6	100	150	100
2	Number of workers:								
	▪ 1-3 persons	15	100	126	97.7	6	100	147	98
	▪ 4-10 persons	-	-	2	1.6	-	-	2	1.3
	▪ > 10 persons	-	-	1	0.8	-	-	1	0.7
	Total	15	100	129	100	6	100	150	100
3	Wage system:								
	▪ Yes	-	-	19	14.7	1	16.7	20	13.3
	▪ No	15	100	110	85.3	5	83.3	130	86.7
	Total	15	100	129	100	6	100	150	100

3. Production System

All the farmers (100%, 150 respondents) say that eggs are the main purpose of the farming. Ducks are sold, as culling ducks, only when they are no longer productive. Several farmers also hatch the eggs. The productive period usually starts at the age of 24 weeks and ends at the age of 2 years or above. A few respondents sell ducks in the productive period only in case of urgent needs and higher price.

Eighty nine (69) respondents have egg productions ranging from 50% to 75% per month (46%). 47 respondents (31.3%) have above 75% per month, and 34 respondents (22.7%) have less than 50% per month. Eggs are usually laid inside the confinements (92.7%, 139 out of 150 respondents), but sometimes also in the yards (3.3%), and in the herding areas (4.0%). Eggs are collected in the morning before the ducks are herded to scavenge.

The majority of the respondents (40.7%, 61 out of 150 respondents) throw away the manure around the confinements or in yard. Some (24.7%) use the manure as fertilizer for their own planting farms or gardens; some others sell the manure to other people (16.7%) or give it to others (11.3%). The others pay no care of the manure and no management of manure is applied (6.7%). Feathers are not commonly utilized as by-product. Production systems by district are shown in Table 29.

Table 29. Production systems by district

No	Classifications	Pemalang		Brebés		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Main purpose of farm:												
	▪ Egg	30	100	30	100	30	100	30	100	30	100	30	100
	Total	30	100	30	100	30	100	30	100	30	100	150	100
2	Egg production / month :												
	▪ < 50 %	9	30	11	36.7	8	26.7	4	13.3	2	6.7	34	22.7
	▪ 50-75 %	18	60	13	43.3	10	33.3	15	50	13	43.3	69	46
	▪ > 75 %	3	10	6	20	12	40	11	36.7	15	50	47	31.1
	Total	30	100	30	100	30	100	30	100	30	100	150	100
3	Place where eggs are laid:												
	▪ Inside the confinements	27	90	23	76.7	30	100	29	96.7	30	100	139	92.7
	▪ In the yards	2	6.7	3	10	-	-	-	-	-	-	5	3.3
	▪ In herding areas	1	3.3	4	13.3	-	-	1	3.3	-	-	6	4.0
	Total	30	100	30	100	30	100	30	100	30	100	150	100
4	Manure treatment:												
	▪ Thrown away	9	30	13	43.3	14	46.7	15	50	10	33.3	61	40.7
	▪ Used as fertilizer	6	20	6	20	9	30	5	16.7	11	36.7	37	24.7
	▪ Sold as fertilizer	9	30	6	20	7	23.3	1	3.3	2	6.7	25	16.7
	▪ Given to other people	6	20	1	3.3	-	-	3	10	7	23.3	17	11.3
	▪ No treatment	-	-	4	13.3	-	-	6	20	-	-	10	6.7
	Total	30	100	30	100	30	100	30	100	30	100	150	100

No differences in the production systems are observed in all the farming systems adopted. All the respondents (100 %) say that eggs are the main purpose of the farming. Six out of 15 farmers adopting free range scavenging system (40%) say that they had low egg production at the time of survey, less than 50% per month. Four others (26.7%, 4 out of 15 respondents) had 50-75% per month, while the other 5 (33.3%) had 75% per month.

Sixty two (62) out of the 129 farmers adopting free range with additional feed (48.1%) had egg production ranging from 50% to 75% per month. Forty two respondents (32.6%) had more than 75%, and 25 respondents (19.4%) had less than 50%.

Half of farmers adopting enclosed free range had egg production less than 50% (3 out of 6 respondents, 50%) and the other had 50-75% (3 out of 6 respondents, 50%).

Cumulatively, egg production ranging from 50% to more than 75% is found among farmers adopting free range with additional feed. However, this does not represent all aspects, as the age of the ducks raised is not the same. It needs more specific investigations or studies to compare the egg production by farming system.

Manure as one of the by-products of duck farming is usually given to the owner of the herding areas by farmers adopting free range system (33.3%). The majority of the respondents adopting free range system with additional feed throw away the manure or use it for their own needs. Farmers adopting enclosed free range prefer selling the manure (66.7%) (see Table 30).

Table 30. Production systems by farming system

No	Classifications	Free range – scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Main purpose of farm:								
	▪ Egg	15	100	129	100	6	100	150	100
	T o t a l	15	100	129	100	6	100	150	100
2	Egg production / month:								
	▪ < 50 %	6	40	25	19.4	3	50	34	22.7
	▪ 50-75 %	4	26.7	62	48.1	3	50	69	46
	▪ > 75 %	5	33.3	42	32.6	-	-	47	31.3
	T o t a l	15	100	129	100	6	100	150	100
3	Place where eggs are laid:								
	▪ Inside the confinements	12	80	121	93.8	6	100	139	92.7
	▪ In the yards	2	13.3	3	2.3	-	-	5	3.3
	▪ In the herding areas	1	6.7	5	3.9	-	-	6	4.0
	T o t a l	15	100	129	100	6	100	150	100
4	Manure treatment:								
	▪ Thrown away	4	26.7	56	43.4	1	16.7	61	40.7
	▪ Used as fertilizer	4	26.7	32	24.8	1	16.7	37	24.7
	▪ Sold as fertilizer	-	-	21	16.3	4	66.7	25	16.7
	▪ Given to other people	5	33.3	12	9.3	-	-	17	11.3
	▪ No treatment	2	13.3	8	6.2	-	-	10	6.7
	T o t a l	15	100	129	100	6	100	150	100

4. Animal Health System

Table 31 shows general animal health programs adopted by the respondents in each district. The majority of the respondents (74.7%, 112 out of 150 respondents) do not give a vaccination to their ducks; only 38 farmers (25.3%) do. The percentage of the use of vaccination is similar in all the districts (the number of the respondents who gives vaccination is higher than that who does not). The survey also finds that anthelmintic drug is given; only 24 out of

150 respondents (16.0%) care about the danger of worms. 84.0% of the respondents say that they never give anthelmintic drug to the ducks. Common vaccines given by the respondents are AI vaccine, Medivac AI and Medivac ND. Common anthelmintic given are Combantrin[®], Nemasiol[®], Upixon[®], Jamu Jago[®] and Kamsekcou[®].

The percentage of the use of antibiotics is similar in all the districts. Eighty five out of 150 respondents (56.7%) do not give antibiotics for sick ducks, and 43.3% do. Information on the use of antibiotics is easily spread among farmers, although they sometimes do not understand exactly the advantages of such drug. Common antibiotics given are Antisnot[®], Tetrachlor[®], Colibac[®], Enromas[®], Supralit[®], Taclor[®], Trimezyne[®], Sulfadiazine[®] and Chlorifit[®].

The majority of respondents are quite familiar with vitamins. 72.7% of the respondents say they give vitamins to their ducks as the effects of the vitamins on the ducks can be obviously seen. Most of the farmers say that they are happy to see the ducks look great and healthy after being given some vitamins. Brands usually used by farmers are B-Complex[®], B12[®], Anaegg[®], Anavit[®], Ciami[®], Anapest[®], Egg Stimulant[®], Vitachick[®], Vitastress[®], Turbo[®], and Vitabro[®].

The farmers get the information on animal health programs and the use of commercial medicine from various sources. A large part of the respondents (49.3%, 74 out of 150 respondents) get the information from other farmers and 44.0% from the district livestock service officers. Only 4 respondents (2.7%) get the information from veterinarians from animal health posts. Six (6) respondents (4%) admit that they know nothing about the animal health programs. Poultry shop is another source of the information.

After receiving the information, most of the farmers want to apply the medicine to their sick ducks by themselves (58.7%). Some others report to the district animal health officers to get some help (34.7%). If the medication works, the information is quickly spread among farmers. Then, they try to cure their ducks themselves.

Table 31. Animal health programs by district

No	Classifications	Pemalang		Brebes		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Vaccination:												
	▪ Yes	1	3.3	5	16.7	12	40	10	33.3	10	33.3	38	25.3
	▪ No	29	96.7	25	83.3	18	60	20	66.7	20	66.7	112	74.7
	Total	30	100	30	100	30	100	30	100	30	100	150	100
2	Anthelmintic:												
	▪ Yes	-	-	2	6.7	7	23.3	15	50	-	-	24	16
	▪ No	30	100	28	93.3	23	76.7	15	50	30	100	126	84
	Total	30	100	30	100	30	100	30	100	30	100	150	100
3	Antibiotics:												
	▪ Yes	22	73.3	14	16	11	36.7	10	33.3	8	26.7	65	43.3
	▪ No	8	26.7	46.7	53.3	19	63.3	20	66.7	22	73.3	85	56.7
	Total	30	100	30	100	30	100	30	100	30	100	150	100
4	Vitamins:												
	▪ Yes	24	80	24	80	27	90	18	60	16	53.3	109	72.7
	▪ No	6	20	6	20	3	10	12	40	14	46.7	41	27.3
	Total	30	100	30	100	30	100	30	100	30	100	150	100
5	Source of the health programs:												
	▪ Veterinarians of animal health post	-	-	-	-	3	10	-	-	1	3.3	4	2.7
	▪ Animal health district officers	16	53.3	6	20	15	50	6	20	23	76.7	66	44
	▪ Other farmers	3	43.3	22	73.3	11	36.7	22	73.3	6	20	74	49.3
	▪ Never know about the programs	1	3.3	2	6.7	1	3.3	2	6.7	-	-	6	4
	Total	30	100	30	100	30	100	30	100	30	100	150	100
6	Animal health program executors:												
	▪ Veterinarians of animal health post	-	-	-	-	4	13.3	-	-	1	3.3	5	3.3
	▪ Animal health district officers	10	33.3	2	6.7	13	43.3	2	6.7	25	83.3	52	34.7
	▪ Farmers	19	63.3	25	83.3	12	40	28	93.3	4	13.3	88	58.7
	▪ None	1	3.3	3	10	1	3.3	-	-	-	-	5	3.3
	Total	30	100	30	100	30	100	30	100	30	100	150	100

General illustration of animal health program by farming system is shown in Table 32. No differences are observed among the districts. The results of the questionnaires show that most of the farmers adopting free range scavenging system (93.3%) get the information on animal health program from other farmers, and that they apply the medications by themselves. As they keep moving, the farmers have little contact with the district animal health officers.

Things are very much different in the other two groups (free range with additional feed and enclosed free range). Farmers of these groups usually join farmers groups, so it is much easier for the animal health district officers to disseminate the information or help the farmers with medications.

Table 32. Animal health programs by farming system

No	Classifications	Free range - scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Vaccination :								
	▪ Yes	2	13.3	36	27.9	-	-	38	25.3
	▪ No	13	86.7	93	72.1	6	100	112	74.7
	Total	15	100	129	100	6	100	150	100
2	Anthelmintic :								
	▪ Yes	-	-	24	18.6	-	-	24	16
	▪ No	15	100	105	81.4	6	100	126	84
	Total	15	100	129	100	6	100	150	100
3	Antibiotics :								
	▪ Yes	8	53.3	55	42.6	2	33.3	65	43.3
	▪ No	7	46.7	74	57.4	4	66.7	85	56.7
	Total	15	100	129	100	6	100	150	100
4	Vitamins :								
	▪ Yes	13	86.7	91	70.5	5	83.3	109	72.7
	▪ No	2	13.3	38	29.5	1	16.7	41	27.3
	Total	15	100	129	100	6	100	150	100
5	Source of animal health programs :								
	▪ Veterinarians of animal health post	-	-	4	3.1	-	-	4	2.7
	▪ Animal health district officers	-	-	64	49.6	2	33.3	66	44
	▪ Other farmers	14	93.3	57	44.2	3	50	74	49.3
	▪ Never know about the information	1	6.7	4	3.1	1	16.7	6	4
	Total	15	100	129	100	6	100	150	100
6	Animal health program executor :								
	▪ Veterinarians of animal health post	-	-	5	3.9	-	-	5	3.3
	▪ Animal health district officers	-	-	52	40.3	-	-	52	34.7
	▪ Farmers	14	93.3	69	53.5	5	83.3	88	58.7
	▪ None	1	6.7	3	2.3	1	16.7	5	3.3
	Total	15	100	129	100	6	100	150	100

The most common symptom is paralysis (61.3%, 92 out of 150 respondents), occurring more frequently than others such as diarrhea, cough/sneeze, weak condition and loss of appetite. Commonly found symptoms are sleepiness, turned or twisted neck, white droppings and exudates from the ears. Sick ducks are mostly treated with medications by the farmers (53.3%). This is common in all the districts except in the district of Tangerang.

Farmers in Tangerang prefer slaughtering their sick ducks and sell the meat for consumption (60%). This might be due to the fact that they have a better understanding of transmission of diseases, or they do not want to lose any economic value of the ducks. Other farmers sell the sick ducks and group them in special confinements; several others use no special treatment.

In addition to pharmaceutical products, self-made traditional medicines are used by more than half of the farmers (64.7%, 97 out of 150 respondents). Traditional medicines are usually given to increase the immune system. They include papaya leaf, *pace* leaf, *lamtoro* leaf, *kiomang* leaf, *kiareng* leaf, *peci plukan* leaf, tamarine-brown sugar, salt, milk-soda, sugar-water coconut, ginger, *kencur* (*Kaempferia galanga*) and *temulawak* (*Curcuma xanthorrhiza*).

Table 33 shows the symptom of diseases often found and the treatment done by district.

Table 33. Diseases commonly found and the treatment by district

No	Classifications	Pemalang		Brebes		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Treatment of sick ducks :												
	▪ Sold	13	43.3	2	6.7	2	6.7	2	6.7	2	6.7	21	14
	▪ Slaughtered	1	3.3	2	6.7	-	-	1	3.3	18	60	22	14.7
	▪ Given some medications	14	46.7	14	46.7	22	73.3	21	70	9	9	80	53.3
	▪ No treatment	2	6.7	10	14	4	13.3	6	20	1	3.3	23	15.3
	▪ Others	-	-	2	10	2	6.7	-	-	-	-	4	2.7
	Total	30	100	30	100	30	100	30	100	30	100	150	100
2	Symptoms / diseases commonly found:												
	▪ Diarrhea	-	-	5	16.7	11	36.7	-	-	1	3.3	17	11.3
	▪ Cough/sneeze	7	23.3	2	6.7	2	6.7	10	33.3	4	13.3	25	16.7
	▪ Loss of appetite	2	6.7	1	3.3	-	-	3	10	2	6.7	8	5.3
	▪ Paralysis	17	56.7	19	63.3	17	56.7	16	53.3	23	76.7	92	61.3
	▪ Others	4	13.3	3	10	-	-	1	3.3	-	-	8	5.3
	Total	30	100	30	100	30	100	30	100	30	100	150	100
3	Use of traditional remedies :												
	▪ Yes	14	46.7	15	50	26	86.7	23	76.7	19	63.3	97	64.7
	▪ No	16	53.3	15	50	4	13.3	7	7	11	36.7	53	35.3
	Total	30	100	30	100	30	100	30	100	30	100	150	100

No differences are found in analysis by farming system. The most commonly found symptom is paralysis. It often results from injured legs (stabbed by dried rice stalks or husk, or by fish bone or pieces of cockle shells as part of additional feed) (see Table 34)

Table 34. Diseases commonly found and the treatment by farming system

No	Classifications	Free range – scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Treatment of sick duck :								
	▪ Sold	3	20	18	14	-	-	21	14
	▪ Slaughtered	-	-	22	17.1	-	-	22	14.7
	▪ Given some medications	9	60	66	51.2	5	83.3	80	53.3
	▪ No treatment	3	20	19	14.7	1	16.7	23	15.3
	▪ Others	-	-	4	3.1	-	-	4	2.7
	Total	15	100	129	100	6	100	150	10
2	Symptoms or diseases commonly found:								
	▪ Diarrhea	3	20	14	10.9	-	-	17	11.3
	▪ Cough/sneeze	3	20	22	17.2	-	-	25	16.7
	▪ Loss of appetite	2	13.3	6	4.7	-	-	8	5.3
	▪ Paralysis	6	40	82	64.1	4	66.7	92	61.3
	▪ Others	1	6.7	5	3.9	2	33.3	8	5.3
	Total	15	100	129	100	6	100	150	100
3	Use of traditional remedies								
	▪ Yes	7	46.7	86	66.7	4	66.7	97	64.7
	▪ No	8	53.3	43	33.3	2	33.3	53	35.3
	Total	15	100	129	100	6	100	150	100

The interviews also show that most of the respondents are not aware enough about the cause of the symptoms found. Table 35 shows the relation between the symptoms and the associated diseases. The table, however, does not show the actual diseases in their poultry. Further information will be needed, both from the respondents and the district animal health services and supported by laboratory tests, to identify the disease.

Table 35. Symptoms commonly found and their associated diseases

Symptom commonly found	Associated disease	Notes
Diarrhea	Duck Cholera	Infectious Disease
	Coccidiosis	Infectious Disease
	Salmonellosis	Infectious Disease
	Too much salt in the feed	Non-Infectious Disease
	Colibacillosis	Infectious Disease
	Spirochaetosis / Duck Tick Fever	Infectious Disease
Cough/Sneeze	Chronic Respiratory Disease	Infectious Disease
	Infectious Sinusitis	Infectious Disease
Loss of appetite	-	Common signs for all disease (Infectious and Non-Infectious Disease)
Paralysis	Botulism / Limberneck	Infectious Disease
	Spirochaetosis / Duck Tick Fever	Infectious Disease
Sleepiness	Lack of Vitamin A	Non-Infectious Disease
Turned or twisted neck	New castle Disease	Infectious Disease
White droppings	Pullorum	Infectious Disease
Exudates from eyes, nostril or the ear	Chronic Respiratory Disease	Infectious Disease
	Salmonellosis	Infectious Disease
	Lack of Vitamin A	Non-Infectious Disease

Source : Samosir, DJ (1983); FAO technical guide book (2004)

The questionnaires show that the highest duck mortality rate per month is 1% (58%, 87 out of 150 respondents). The highest mortality rate in Pemalang,

Brebes and Subang is 1%. In Cirebon, duck mortality rates of 1% and 2.5% per month are found evenly among the farmers. In Tangerang the highest duck mortality rate is 2.5% per month (50%, 15 out of 30 respondents).

The main cause of the death is paralysis (60%, 90 out of 150 respondents). The paralysis results from poor treatment of injured legs (stabbed by dried rice stalks or husk). As such, the wound gets worse and leads to the death of the ducks. Other causes of death are consuming rotting cadaver or insecticides, and being pressed and suffocated during transport.

The most common treatment of dead ducks is dumping them into the rivers (59.3%, 89 out of 150 respondents). Some farmers dump dead ducks to abandoned paddy field areas. Some of the respondents (36%, 54 respondents) bury dead ducks, usually in abandoned paddy field areas, around the confinement, or abandoned pond and dried rivers. Only 4% burn dead ducks. One respondent (0.7%) processes dead ducks for fish feed.

Eighty three (83) out of 150 respondents (53.3%) deal with the high mortality rate by themselves; 40 others (26.7%) report the case to their respective district animal health officers. Twenty seven (27) others (18%) say they have never experienced such a case (see Table 36).

Table 36. Duck mortality and the treatment by district

No	Classifications	Pemalang		Brebes		Cirebon		Subang		Tangerang		T o t a l	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Treatment of dead duck :												
	▪ Burned	-	-	-	-	-	-	3	10	3	10	6	4
	▪ Buried	5	16.7	19	63.3	14	46.7	2	6.7	14	46.7	54	36
	▪ Dumped	25	83.3	11	36.7	16	53.3	24	80	13	43.3	89	59.3
	▪ Processed into fish-feed	-	-	-	-	-	-	1	3.3	-	-	1	0.7
	T o t a l	30	100	30	100	30	100	30	100	30	100	150	100
2	Mortality rate / month :												
	▪ < 1 %	1	3.3	2	6.7	1	3.3	8	26.7	1	3.3	13	8.7
	▪ 1 %	26	86.3	23	76.7	10	33.3	14	46.7	14	46.7	87	58
	▪ 2-5 %	2	6.7	4	13.3	10	33.3	4	13.3	15	50	35	23.3
	▪ 6-10 %	-	-	-	-	7	23.3	2	6.7	-	-	9	6
	▪ 11-20 %	-	-	-	-	2	6.7	1	3.3	-	-	3	2
	▪ > 25 %	1	3.3	1	3.3	-	-	1	3.3	-	-	3	2
	T o t a l	30	100	30	100	30	100	30	100	30	100	150	100
3	Main cause of death :												
	▪ Diarrhea	2	6.7	5	16.7	10	33.3	-	-	-	-	17	11.3
	▪ Loss of appetite	4	13.3	3	10	2	6.7	-	-	1	3.3	10	6.7
	▪ Cough/sneeze	5	16.7	-	-	2	6.7	7	23.3	3	10	17	11.3
	▪ Paralysis	12	40	19	63.3	15	50	18	60	26	86.7	90	60
	▪ Others	7	23.3	3	10	1	3.3	5	16.7	-	-	16	10.7
	T o t a l	30	100	30	100	30	100	30	100	30	100	150	100
4	Action when high mortality rate occurs:												
	▪ Report to the district animal health officer	2	6.7	4	13.3	13	43.3	4	13.3	17	56.7	40	26.7
	▪ Handle by themselves	24	80	21	70	12	40	15	50	11	36.7	83	55.3
	▪ Others	4	13.3	5	16.7	5	16.7	11	36.7	2	6.7	27	18
	T o t a l	30	100	30	100	30	100	30	100	30	100	150	100

Duck mortality rate by farming system is shown in Table 37. There are no differences between the mortality rate by district and that by farming system. Farmers adopting free range system say that the mortality rate ranges from less than 1% to 1% per month. The rate is higher in farmers adopting free range system with additional feed, but in most cases it ranges from less than 1% to 5%. The table shows that the main cause of the death is paralysis. A high mortality rate is usually handled by themselves and not reported to the district animal health officers for further investigations.

Table 37. Duck mortality and the treatment by farming system

No	Classifications	Free range - scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Treatment of dead duck :								
	▪ Burned	-	-	6	4.7	-	-	6	4
	▪ Buried	8	53.3	45	34.9	1	16.7	54	36
	▪ Dumped	7	46.7	77	59.7	5	83.3	89	59.3
	▪ Processed into fish-feed	-	-	1	0.8	-	-	1	0.7
	T o t a l	15	100	129	100	6	100	150	10
2	Mortality rate / month :								
	▪ < 1 %	1	6.7	10	7.8	2	33.3	13	8.7
	▪ 1 %	14	93.3	72	55.8	1	16.7	87	58
	▪ 2-5 %	-	-	33	25.6	2	33.3	35	23.3
	▪ 6-10 %	-	-	9	7	-	-	9	6
	▪ 11-20 %	-	-	3	2.3	-	-	3	2
	▪ > 25 %	-	-	2	1.6	1	16.7	3	2
	T o t a l	15	100	129	100	6	100	150	100
3	Main causes of death :								
	▪ Diarhea	1	6.7	16	12.4	-	-	17	11.3
	▪ Loss of appetite	4	26.7	6	4.7	-	-	10	6.7
	▪ Cough/sneeze	1	6.7	16	12.4	-	-	17	11.3
	▪ Paralysis	6	40	79	61.2	5	83.3	90	60
	▪ Others	3	20	12	9.3	1	16.7	16	10.7
	T o t a l	15	100	129	100	6	100	150	100
4	Action when high mortality rate occurs:								
	▪ Report to district animal health officer	-	-	39	30.2	1	16.7	40	26.7
	▪ Handle by themselves	12	80	67	51.9	4	66.7	83	55.3
	▪ Others	3	20	23	17.8	1	16.7	27	18
	T o t a l	15	100	129	100	6	100	150	100

Cleaning up the confinements is commonly done by the majority of the respondents. 88% of the total respondents (132 respondents) say that they clean up their confinements, and 18 respondents say that they never do. The cleaning up frequency varies from district to district, but, in general, there is no regular cleaning up frequency; the frequency depends primarily on the weather, which greatly affects the humidity of the confinements (see Table 38).

Table 38. Frequency and way of cleaning up by district

No	Classifications	Pemalang		Brebes		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cleaning up the confinement :												
	▪ Yes	26	86.7	26	86.7	26	86.7	25	83.3	29	96.7	132	88
	▪ No	4	13.3	4	13.3	4	13.3	5	16.7	1	3.3	18	12
	T o t a l	30	100	30	100	30	100	30	100	30	100	150	100
2	Frequency of cleaning up:												
	▪ Twice per day	-	-	-	-	6	23.1	-	-	-	-	6	4.5
	▪ Once per day	-	-	3	11.5	4	15.4	1	40	5	17.2	13	9.8
	▪ Once in 2 days	14	53.8	3	11.5	7	26.9	6	24	5	17.2	35	26.5
	▪ Once in 3 days	5	19.2	9	34.6	5	19.2	3	12	1	3.4	23	17.4
	▪ Others	7	26.9	11	42.3	4	15.4	15	60	18	62.1	55	41.7
	T o t a l	26	100	26	100	26	100	25	100	29	100	132	100
3	Way of cleaning up:												
	▪ Sweeping	4	15.4	5	19.2	17	65.4	4	16	15	51.7	45	34.1
	▪ Sweeping and applying some disinfectants	-	-	5	19.2	3	11.5	-	-	2	6.9	10	7.6
	▪ Others	22	84.6	16	61.5	6	23.1	21	84	12	41.4	77	58.3
	T o t a l	26	100	26	100	26	100	25	100	29	100	132	100

10 farmers adopting free range scavenging system say that they clean up the confinements at irregular frequency. Other ways of cleaning up shown in Table 39 are replacing the old husk with the new one or just adding some onto the old one to increase the warmth. Some farmers spray kerosene and spread salt around the confinement to prevent natural predators such as snakes from getting close. These are practiced by all farmers adopting free range scavenging system and enclosed free range. Only farmers adopting free range system with additional fee clean up the confinements by sweeping (38.5%) and applying disinfectants (8.5%). Others say that they clean up the confinements only when the confinements need cleaning or when they have time for that.

Table 39. Frequency and way of cleaning up by farming system

No	Classifications	Free range – scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Cleaning up the confinement :								
	▪ Yes	10	66.7	117	90.7	5	83.3	132	88
	▪ No	5	33.3	12	9.3	1	16.7	18	12
	T o t a l	15	100	129	100	6	100	150	100
2	Frequency of cleaning up:								
	▪ Twice per day	-	-	6	5.1	-	-	6	4.5
	▪ Once per day	1	10	12	10.3	-	-	13	9.8
	▪ Once in 2 days	1	10	33	28.2	1	20	35	26.5
	▪ Once in 3 days	4	40	19	16.2	-	-	23	17.4
	▪ Others	4	40	47	40.2	4	80	55	4.7
	T o t a l	10	100	117	100	5	100	132	100
3	Way of cleaning up:								
	▪ Sweeping	-	-	45	38.5	-	-	45	34.1
	▪ Sweeping and applying some disinfectants	-	-	10	8.5	-	-	10	7.6
	▪ Others	10	100	62	53	5	100	77	58.3
	T o t a l	10	100	117	100	5	100	132	100

5. Marketing System

The majority of the respondents (78.7%) market the outputs (eggs) through collectors or middlemen. More than half of the respondents sell the eggs to farmers groups, which in turn sell them to collectors, or directly to the collector/middleman everyday (52.7%). Eggs are sold on a daily to by-weekly basis. Collectors collect eggs from farmers and then send them to markets. Several farmers sell the eggs directly to the surrounding neighbors/customers, customers in the market, or send them to hatcheries. No special treatment is applied to the eggs collected by farmers from the confinement before being sent to the market (see Table 40).

Table 40. Marketing system by district

No	Classifications	Pemalang		Brebes		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Frequency of selling:												
	▪ Once a week	-	-	1	3.3	-	-	-	-	6	20	7	4.7
	▪ Once in 2 weeks	-	-	1	3.3	-	-	-	-	-	-	1	0.7
	▪ Everyday	12	40	22	73.3	27	90	9	30	9	30	79	52.7
	▪ Every 2 days	14	46.7	1	3.3	3	10	8	26.7	8	26.7	29	19.3
	▪ Every 3 days	3	10	1	3.3	-	-	5	16.7	5	16.7	25	16.7
	▪ Every 4 days	-	-	1	3.3	-	-	1	3.3	1	3.3	3	2
	▪ Every 5 days	1	3.3	3	10	-	-	1	3.3	1	3.3	6	4
	Total	30	100	30	100	30	100	30	100	30	100	150	100
2	Buyers:												
	▪ Collectors	25	83.3	25	83.3	26	86.7	29	96.7	13	43.3	118	78.7
	▪ Small sellers	-	-	-	-	2	6.7	-	-	16	53.3	18	12
	▪ Directly to household customers	-	-	2	6.7	-	-	1	3.3	-	-	3	2
	▪ Directly to customers in the market	-	-	3	10	-	-	-	-	1	3.3	4	2.7
	▪ Others	5	16.7	-	-	2	6.7	-	-	-	-	7	4.7
	Total	30	100	30	100	30	100	30	100	30	100	150	100
3	Origin of buyers:												
	▪ From within the village	23	76.7	22	73.3	18	60	26	86.7	16	53.3	105	70
	▪ From other sub-districts / districts	7	23.3	6	20	11	36.7	4	13.3	14	46.7	42	28
	▪ From other provinces	-	-	2	6.7	1	3.3	-	-	-	-	3	2
	Total	30	100	30	100	30	100	30	100	30	100	150	100
4	Way of delivery:												
	▪ Farmers deliver the outputs to customers	11	36.7	5	16.7	13	43.3	4	13.3	4	13.3	37	24.7
	▪ Customers collect the outputs	19	63.3	25	83.3	17	56.7	26	86.7	26	86.7	113	75.3
	Total	30	100	30	100	30	100	30	100	30	100	150	100

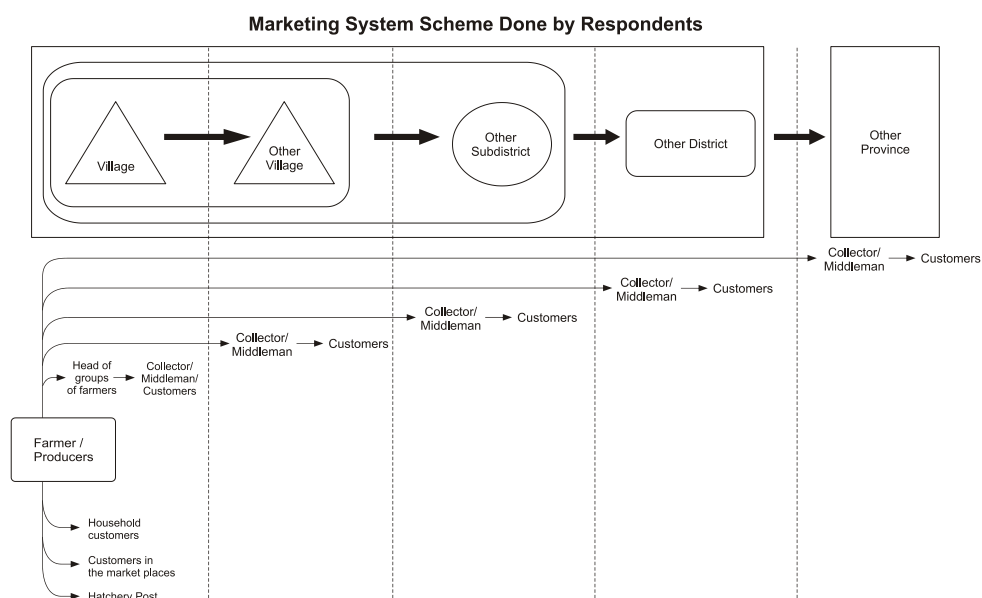
Collectors still play an important role in all the farming systems (see Table 41). Farmers collect the eggs everyday, and collectors fetch them in 1-3 days. Collectors or middlemen also supply farmers with what they need, including loan, the payment of which is eggs. Therefore, egg price at farmer level does not fluctuate greatly because collectors dictate the price at all times.

Table 41. Marketing system by farming system

No	Classifications	Free range - scavenging system		Free range with additional feed		Enclosed free range		T o t a l	
		N	%	N	%	N	%	N	%
1	Frequency of selling: ▪ Once a week ▪ Once in 2 weeks ▪ Everyday ▪ Every 2 days ▪ Every 3 days ▪ Every 4 days ▪ Every 5 days	1 1 6 2 3 - 2	6.7 6.7 40 13.3 20 - 13.3	6 - 69 27 20 3 4	4.7 - 53.5 20.9 15.5 2.3 3.1	- - 4 - 2 - -	- - 66.7 - 33.3 - -	7 1 79 29 25 3 6	4.7 0.7 52.7 19.3 16.7 2 4
	T o t a l	15	100	129	100	6	100	150	100
2	Sold to: ▪ Collectors ▪ Small sellers ▪ Directly to the household customers ▪ Directly to customers in the markets ▪ Other	15 - - - -	100 - - - -	97 18 3 4 7	75.2 14 2.3 3.1 5.4	6 - - - -	100 - - - -	118 18 3 4 7	78.7 12 2 2.7 4.7
	T o t a l	15	100	129	100	6	100	150	100
3	Origin of buyer : ▪ From within the village ▪ From other sub-districts / districts ▪ From other provinces	10 5 -	66.7 33.3 -	90 36 3	69.8 27.9 2.3	5 1 -	83.3 16.7 -	105 42 3	70 28 2
	T o t a l	15	100	129	100	6	100	150	100
4	Way of delivery: ▪ Farmers deliver the outputs to customers ▪ Customers collect the outputs	3 12	20 80	34 95	26.4 73.6	- 6	- 100	37 113	24.7 75.3
	T o t a l	15	100	129	100	6	100	150	100

Figure 3 shows the general scheme of marketing systems in all the districts. Middlemen play an important role in almost all parts of the marketing system.

Figure 3. Marketing system scheme



6. Respondents Experiences on Avian Influenza

Ten (10) out of 150 respondents (6.7%) speak of Avian Influenza outbreak in their areas, while 140 other respondents say that the outbreak never occurs or they know or hear nothing about the case.

Four respondents from Pemalang say that an outbreak of Avian Influenza occurred in 2003, while 3 respondents from Brebes speak of an outbreak in 2002 (1 respondent) and in 2005 (2 respondents). Two respondents from Cirebon speak of an outbreak in 2004 and 1 respondent from Tangerang says nothing because he does not remember when the outbreak occurred.

Of the ten respondents knowing about the outbreaks, 4 admit that their ducks were infected by AI (2 from Brebes, 1 from Cirebon, 1 from Tangerang). All are farmers adopting free range system with additional feed. Table 42 gives Avian Influenza cases by district, and Table 43, by farming system.

Table 42. Avian influenza cases by district

No	Classifications	Pemalang		Brebes		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Is the area ever hit by Avian Influenza epidemic?												
	▪ Yes	4	13.3	3	10	2	6.7	-	-	1	3.3	10	6.7
	▪ No	26	86.7	27	90	28	93.3	30	100	29	96.7	140	93.3
	Total	30	100	30	100	30	100	30	100	30	100	30	100
2	Year of occurrence:												
	▪ 2002	-	-	1	33.3	-	-	-	-	-	-	1	10
	▪ 2003	4	100	-	-	-	-	-	-	-	-	4	40
	▪ 2004	-	-	-	-	2	100	-	-	-	-	2	20
	▪ 2005	-	-	2	66.7	-	-	-	-	-	-	2	20
	▪ No answer	-	-	-	-	-	-	-	-	1	100	1	10
	Total	4	100	3	100	2	100	-	-	1	100	10	100
3	Are the ducks infected?												
	▪ Yes	-	-	2	66.7	1	50	-	-	1	100	4	40
	▪ No	4	100	1	33.3	1	50	-	-	-	-	6	60
	Total	4	100	3	100	2	100	-	-	1	100	10	100

Table 43. Avian Influenza cases by farming system

No	Classifications	Free range - scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Is the area ever hit by Avian Influenza epidemic?								
	▪ Yes	1	6.7	7	5.4	2	33.3	10	6.7
	▪ No	14	93.3	122	94.6	4	66.7	140	93.3
	Total	15	100	129	100	6	100	150	100
2	Year of occurrence:								
	▪ 2002	-	-	1	14.3	-	-	1	10
	▪ 2003	-	-	2	28.6	2	100	4	40
	▪ 2004	-	-	2	28.6	-	-	2	20
	▪ 2005	1	14.3	1	14.3	-	-	2	20
	▪ No answer	-	-	1	14.3	-	-	1	10
	Total	1	100	7	100	2	100	10	100
3	Are the ducks infected?								
	▪ Yes	-	-	4	57.1	-	-	4	40
	▪ No	1	100	3	42.9	2	100	6	60
	Total	1	100	7	100	2	100	10	100

Three out of 140 respondents saying no AI outbreak ever occurred in their areas say that their ducks died of AI. They are farmers from Tangerang adopting free range system with additional feed. This rather contradicting answer reflects their not knowing of the case, or suggests that the outbreak did occur but not in their areas (Table 44).

Table 44. Percentage of respondents not finding the outbreak of AI but admitting the death of their ducks by AI

No	Not finding AI cases	Pemalang		Brebes		Cirebon		Subang		Tangerang		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Are the ducks infected by AI?												
	▪ Yes	-	-	-	-	-	-	-	-	3	10.3	3	2.1
	▪ No	26	100	27	100	28	100	30	100	26	89.7	137	97.9
	Total	30	100	30	100	30	100	30	100	30	100	30	100

Table 45 gives the kinds and the number of fowls attacked by AI. Three out of 7 farmers whose fowls were attacked by AI chose not to report the case to the district animal health officers. They just believed in information from other farmers. There are no clear reasons why they did not report the case. They might not have wanted to report or they thought it was their destiny or the risk they had to take. They said that they had never got any information on Avian Influenza from the district animal health officers. They got information (not very clear information) from other farmers and from TV. Dead fowls were thrown into the rivers. Sick fowls were given some medications, or slaughtered for self-consumption or for sale. Some farmers kept healthy fowls in special confinements. All the tools and confinements used for the sick fowls were washed with water and soap, without disinfectants.

Farmers who reported high mortality rate of their fowls to the district animal health officers said that they got fast responses, though some officers were slow in responding. The district animal health officers suggested that they bury the dead fowls, separate and give some medications to sick fowls, separate and take care of healthy fowls, clean up and apply some disinfectants to all the tools and confinements in contact with the sick fowls.

Table 45. Fowls attacked by AI

No	District of respondents	Fowls dying of AI	Number fowls dying of AI	Source of information on AI diagnosis	Report to the district animal health officers?
1	Brebes	Chicken	12	Other farmers	No
2	Brebes	Chicken	10	Other farmers	No
3	Cirebon	Duck	300	District Animal health officers	Yes
4	Tangerang	Chicken	10	District Animal health officers	Yes
5	Tangerang	Ducklings	4000	Other farmers	No
6	Tangerang	Duck	120	District Animal health officers	Yes
7	Tangerang	Duck	300	Other farmers	No

6.1.3. Results of District Officer's Questionnaire

1. General Problems and Responses

General problems found in all the districts (see Annex 3) are fluctuating price of feed, uncertain amount of natural feed, low output price, and lack of funds or access to capital. Other problems are poor public awareness and wide distributions of duck farmers, especially those adopting traditional/extensive systems.

The responses given by the district officers include providing capital rent with low interest, holding presentation to raise public awareness, providing training as continuation of the public education program, and proposing more intensive system husbandry for extensive farmers.

2. District Officer's Experiences In Handling Avian Influenza Cases

The results of the district officer's questionnaires show that Avian Influenza cases occurred in all the districts (see Annex 3), attacking

broilers/layers, quails, Muscovy ducks and 'Cemani' chickens. It should be noted here that the sub-districts where AI cases were found are not within the districts where the survey was conducted. That is why the answers collected did not represent the actual occurrence of AI cases. Most of the respondents know nothing about AI cases occurring outside their villages or sub-districts.

All the district officers in the surveyed districts used clinical and laboratory, including anatomy and pathology, diagnoses to identify the AI cases. However, the district laboratories did not have the needed equipment for AI diagnoses, especially serological diagnoses. So, the samples were sent to qualified laboratories and it took 2-15 days to obtain the result. Among the laboratories are Research Institute of Veterinary Science (Bogor), Diseases Investigation Center (BPPV) (Wates, Jogjakarta), Animal Health Laboratory of Livestock Department (Province of West Java) and *UPTD Balai Penyidikan Penyakit Hewan dan Kesmavet* (Research Institute of Animal Diseases and Veterinary Public Health / Animal Diseases Center) (Cikole, Lembang).

The district animal health officers were guided by 9-step Standard Operating Procedure issued by the government under Decree of Director of General Livestock Services No. 17/Kpts/PD.640/F/02.04. The 9 (nine) steps are bio security, vaccination, depopulation, movement control, surveillance, restocking, stamping out, public awareness, monitoring and evaluation. However, not all the steps could be implemented due to the following problems: lack of facilities, lack of man powers, lack of funds, lack of the regulations governing compensations for slaughtered fowls both at central and district level, and poor public awareness.

The decree also incorporates AI infection or recurrence prevention. Avian Influenza vaccinations were done 2-3 times in all the districts. While each of the districts has standard facilities for the vaccination, such as refrigerator and cooler boxes, not all the districts are equipped with vaccine temperature gauge.

The regulation governing the slaughtering of the sick animals posed big problems at district level. This is due to the lack of compensation fund. The regulation was not implemented at all in the districts of Tangerang and Cirebon. In the district of Pematang, the implementation was restricted by the amount of funds provided by the central government. The compensation was 3,000 rupiahs for each slaughtered broiler, and 1,000 rupiahs for each slaughtered quail. The districts of Subang and Brebes implemented the regulation, but without any compensation for the farmers. They just called for public awareness. Related to the limited fund, the implementation of the regulation in each district varied. In the districts of Pematang and Brebes all animals in the same cage of the infected animals were slaughtered. In the district of Subang only infected animals were slaughtered.

6.2. Discussion

6.2.1. Identification of Key Risk Areas in the Production System/Cycles for Possible HPAI Transmission

Table 46. Key risk areas identified in the production system/cycles for possible HPAI transmission

No	Classifications	Free range - scavenging system	Free range with additional feed	Enclosed free range
1	Movement of duck from one rice-field area to another	Yes	Yes	No*
2	Contact with other fowls or animals	Yes	Yes	Yes
3	Contact with human	Yes	Yes	Yes
4	Improper feeding system	No*	Yes	Yes
5	Bad sanitation	Yes/No*	Yes	Yes
6	Improper handling of dead ducks	Yes	Yes	Yes
7	Improper handling of sick ducks	Yes	Yes	Yes
8	Improper handling of by-products	Yes	Yes	Yes
9	Improper handling of farm outputs	Yes	Yes	Yes
10	Poor awareness about the disease	Yes	Yes	Yes

Note: () means the system has nothing to do with the item*

Movement of duck from one area to another is said to be a potential risk factor in the spread of HPAI viruses. Recent studies find that healthy ducks excreting sufficient amount of virus sustain transmission and act as reservoir from which the virus can spread through water contamination, resulting in local amplification, persistence and secondary spread to terrestrial poultry. Trade and movement of live birds, including fighting cocks, and live-bird markets have also been identified as potential risk factors in the spread of HPAI caused by H5N1 (Gilbert et. All, 2006).

Contact among the ducks and with other animals or human in the same place also have a high risk, especially when the ducks are infected by viruses. Even though the ducks are not infected, there is still a risk because ducks can act as natural reservoir of the virus. Free range – scavenging system offers a high possibility of contacts among ducks and with other animals or human. In semi-intensive system, ducks are very likely to have contact with men who take care of them or other men via the cage. Semi-intensive confinements with poor bio

security allow other fowls such as chicken, pigeons, geese or other birds to come and shed in duck confinements.

Improper feeding system and bad sanitation are other risk keys identified in the possible spread of HPAI and, in fact, of other diseases.

Improper handling of dead ducks, such as dumping them into unused ponds or the river, applying no treatment to sick animals or mixing sick animals with healthy ones, is another risk key identified.

Improper handling of by-products and farm outputs is also considered as another risk key. Free range – scavenging system allows manure to spread on the rice field areas without any further treatment, and allows it to be brought to confinements, or to be in contact with other birds, mammals or humans.

Based on the results of the questionnaire, no treatment is applied to the eggs waiting for middlemen to fetch, and to manure as by-product of the farm. Sufficient information is not available on whether the middlemen move from one infected area to another during their eggs collecting. Trade of live animals and animal products within and away from infected areas has been proposed as potential pathway for the spread of HPAI (Gilbert et. al, 2006). Low awareness of farmers about HPAI is also potential for the spread of the disease because farmers do not do anything to prevent or handle the cases.

6.2.2. Percentage of Farmers Choosing Not to Restock or Switch to Other Species

Table 47. Percentage of farmers choosing not to restock or switch to other species

No	Classifications	Free range - scavenging system		Free range with additional feed		Enclosed free range		Total	
		N	%	N	%	N	%	N	%
1	Responses following AI outbreak?								
	▪ Still want to rear the ducks but worry that the ducks get infected	-	-	40	39.2	2	40	42	36.5
	▪ Still want to rear the ducks but worry that the family get infected	-	-	14	13.7	-	-	14	12.2
	▪ Still want to rear the ducks but will apply stricter control to the sick ducks	-	-	7	6.9	2	40	9	7.8
	▪ Still want to rear the ducks and not worry about the epidemic	8	100	41	40.2	1	20	50	43.5
	Total	8	100	102	100	5	100	115	100

The study shows that several respondents (2.6%, 4 out of 150 respondents) had their farms infected by AI, but most of the respondents were not afraid of being exposed to the disease. In fact, all the farmers still wanted to

continue to run the farms despite the infection. As shown in Table 47, 115 out of 150 respondents (76.7%) answered that they still wanted to rear the ducks/run the farm. 35 out of 150 respondents did not answer the question because they were confused whether to keep the ducks or switch to other species. But switching to other species was difficult to realize because they had no capital.

Rearing ducks has been practiced for generations. It is no surprise that the majority of the respondents have been running duck farming since long time ago.

6.2.3. Responses from The Government

Following the outbreak, the government formulated 9 (nine) strategies to control AI, which were incorporated in Decree of Director General of Livestock Services No 17/ KPTS/PD.640/02.04 dated February 4th, 2004. The 9 (nine) strategies are as follows:

1. Improvement to bio-security
2. Vaccination in infected and suspected areas
3. Depopulation (selective culling) and compensation
4. Control of movement of live poultry, poultry products and farm waste
5. Surveillance and tracing back
6. Restocking
7. Stamping out in newly infected areas
8. Public awareness
9. Monitoring and evaluation

It turned out that the decree was not applicable in all poultry farms; it was mostly applicable in chicken farms. The implementation of the strategies in large scale poultry farms (sector 1&2) has proved to be able to reduce the Avian Influenza cases in Indonesia. In small scale poultry farms (sector 3&4), however, the strategies are hardly applicable due to many complex problems. Thus, the Avian influenza still cannot be fully controlled and tends to spread to other areas not having been infected by AI.

Related to AI control in Indonesia, the government has issued many regulations/legislation and established instruments to control AI, such as National Committee for Avian Influenza at national level, task force for Avian Influenza, CMU (Campaign Management Unit), *Posko AI*, *Crisis Center* at Department of Agriculture level. At regional and district level, the government established Local Disease Control Centers for AI.

Avian Influenza control program in Indonesia, however, has yet to cover duck farming sector. Studies on Avian Influenza cases in duck farms in Indonesia are very limited so little is known about Avian Influenza in ducks. Ducks and other water fowls can serve as reservoirs of Avian Influenza virus without clinical

symptoms. The lack of Avian Influenza control program for ducks may cause problems in controlling the spread of the disease in poultry in general.

6.2.4. Review of Potential Options for Future Production System to Reduce the Risk of HPAI Transmission

A study done by the Faculty of Veterinary Medicine – IPB in Sumatera and Kalimantan showed that AI virus (H5) could be detected in healthy ducks, Muscovy ducks and geese (RT-PCR). Furthermore, AI virus (H5) could be easily detected in ducks, Muscovy ducks and geese with both seropositive and seronegative results not showing any morbidity or mortality. One of the conclusions from the seroepidemiology study showed that in backyard farming, ducks and muscovy ducks have higher potential as reservoirs in comparison with chicken.

To reduce the risk of AI spread, some improvements must be applied, especially to free range duck farming system because of the ducks movement. Improvements should be done to all parts of the farming and production practices as explained in the identified risk key areas.

Switching the free range – scavenging system to semi-intensive and to intensive system with good/improved biosecurity are potential options to reduce the risk of HPAI transmission without sacrificing future production system. Nevertheless, this needs further investigations and analyses of social economic problems related to the systems.

Replacing or eliminating free range duck system may not be a wise decision until we have conclusive correlation between free range ducks and the spread of Avian Influenza in Indonesia. Farmers can accept such correlation only when they are well informed of the clinical signs of the disease in ducks. At the same time, they should be aware of ducks being capable of acting as reservoir without showing any clinical signs. Further studies and investigations are needed to provide more convincing data to convince farmers. In addition, analytical studies on sociocultural and economic aspects should also recommend how the policy is to be implemented.

VII. CONCLUSION AND RECOMMENDATION

7.1. Conclusion

Identification of several risk keys in the production systems/cycles of free-range duck farming system shows that the system is very likely to

contribute in the spreading of HPAI viruses. This conclusion needs to be strengthened with further analyses and studies on serological and other laboratory diagnostic in the context of HPAI in ducks. Options to better duck production system in the future is to improve the free-range duck system in Indonesia and to apply a better biosecurity in semi intensive duck farming system.

Besides the 9 (nine) strategies of Avian Influenza prevention stated in the Decree of Director General of Livestock Services No 17/KPTS/PD.640 / 02.04 and the associated institutions established under the decree, other legislation and regulations are needed, especially on free-range duck farming system, which are based on the economic and social conditions of Indonesian duck farmers.

7.2. Recommendation

1. Further studies on the role of ducks in spreading AI H5N1 virus should be conducted, such as:
 - Duck seroepidemiological study
 - Duck comparative – seroepidemiological study based on the farming system and the duck production system
 - Seroepidemiological study in chicken within the duck free range area
 - Study on Avian Influenza vaccination effect in ducks
 - Study on shedding virus monitoring in duck
2. AI control programme in Indonesia should be also focused on ducks since they are reservoirs of AI H5N1 virus.
3. Farmer's knowledge and awareness about Avian Influenza should be improved.
4. Improvement should be made to free range duck system in the following areas:
 - Control of movements of ducks
 - Mass vaccination and its monitoring
 - The origins of DODs
 - Sanitation, and handling of dead ducks
 - Biosecurity application

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Annex 1:

Form A

QUESTIONNAIRE FOR DISTRICT OFFICER

Date of survey :
Name of Enumerator :

1. Name of Institution :
- Address :
-
- District/City :
- Province :
- Telephone & Fax :

- ## 2. Respondent Identity

Name :

Position :

- ### 3. Administrative Data

Number of sub-sistricts :

Number of villages :

Topography of the area :

[illegible][illegible]

4. What animal health manpower is available in your district ?

Officer	Number	Notes
Veterinarian		
Paravet		
Extension worker		

7. What animal health facilities are available in your district ?

Facilities		Number
1	Car	
2	Motor cycle	
3	Cold Chain	
	Refrigerator	
	Ice box	
4	Injection equipment	
	Standard	
	Disposable	
5	PPE (Personal Protective Equipment)	
	Boots	
	Gloves	
	Masks	
	Glasses	
	Laboratory uniforms	
	Caps	

6. How many animal markets are there in your district?

.....

.....

.....

.....

.....

.....

.....

7. What problems surround poultry farming, especially of ducks ?

.....

.....

.....

.....

.....

.....

.....

8. What efforts are there or have been done to solve the problems ?

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Experiences in Avian Influenza Case:

1. Have you ever found Avian Influnza cases in your district?

- ☐ Yes
- ☐ No

2. If 'Yes', mention the area and the time of the cases:

No	Sub-district	Village	Month - Year	Fowls attacked

3. From what diagnose is the conclusion that there are Avian Influnza cases in your district area drawn?

- ☐ Clinical signs
- ☐ Clinical signs and laboratory diagnoses
- ☐ Others, please mention:
-

4. Does the district have any laboratories for AI diagnosis?

- ☐ Yes
- ☐ No

5. If 'No', where do you usually send the samples for AI test?

.....

.....

.....

.....

.....

6. How long does it take to obtain the result of the test you requested?
..... days
7. What steps do you do when you find AI cases in your district?
.....
.....
.....
.....
.....
8. Does your district have a standard operating procedure to handle AI cases?
☐ Yes
☐ No
 If 'Yes', please submit a copy of the SOP.
9. What problems have you had during the implementation of the SOP?
.....
.....
.....
.....
.....
10. What measures have you taken to prevent the infection / reinfection of AI in your district area?
.....
.....
.....
.....
.....
.....
11. Do you do vaccination to public poultry?
☐ Yes
☐ No
12. How many times is the vaccination done?
☐ Once
☐ Twice
☐ 3 times
☐ 4 times
13. Does the district administration have the facilities to support the vaccination program?

No	Facilities	Yes	No
1	Refrigerator		
2	Cooler box / termos flasks		
3	Vaccine temperature gauge		

14. Does the district administration slaughter the infected animals?

- ☐ Yes
- ☐ No

15. If 'Yes', which animals are to be slaughtered?

- ☐ Infected animal
- ☐ All animal in the same cage with the infected animal
- ☐ All animals within a certain range from where the case is found

16. Does the district administration give money compensation for the animal slaughtered because of infected by AI?

- ☐ Yes
- ☐ No

17. If 'Yes', what is the average price for the compensation?

- Rupiahs / head
- Rupiahs / head
- Rupiahs / head
- Rupiahs / head
- Rupiahs / head

18. Where does the fund for compensation come from?

- ☐ Central government
- ☐ District government
- ☐ Both of them
- ☐ Others, mention :

....., 2006

Officer	Enumerator

QUESTIONNAIRE FOR FARMER

Date of survey :
 Name of Enumerator :

I. CHARACTERISTICS

1.1 Name of farmer :(M / F)

1.2 Age :

1.3 Address

- Village :
- Sub-district :
- District :
- Province :

1.4 Formal Education :

- Elementary School :years
- Junior High School :years
- Senior High School :years
- College/University :years

1.5 Type of poultry operations/bussines :

- ☐ Main bussines
- ☐ Additional bussines
- ☐ Others :

1.6 Role in duck farming:

- ☐ Owner
- ☐ Worker
- ☐ Partnership
- ☐ Others :

1.7 How long have you been practicing the duck farming ?

- ☐ < 1 years
- ☐ 1-2 years
- ☐ 3-5 years
- ☐ 6-10 years
- ☐ > 10 years

1.8 What is your outside job apart from the duck farmer?

- ☐ Bussinesman
- ☐ Civil servant or military
- ☐ Private employee
- ☐ Paddy farmer
- ☐ Construction worker
- ☐ Others :

II. HUSBANDRY SYSTEM

Type and number of ducks

2.1 Type of duck reared:

- ☐ Alabio
- ☐ Javanese Duck
- ☐ Balinese Duck
- ☐ Mixed in species
- ☐ Others :

2.2 Number of ducks reared:heads

- Female : heads
- Male : heads
- Duckling : heads

2.3 Other animals reared:

Kinds of animal	Number (head)
Local chicken	
Layers/Broilers	
Pigs	
Birds	
Geese	
Quails	
Turkeys	
Pigeons	
.....	
.....	
.....	

2.4 How do you treat these animals against the ducks ?

- ☐ Completely separate them
- ☐ Kepp them next to each other
- ☐ Mixed
- ☐ Others :

Rearing system

2.5 Where is the origin of your ducks?

- Village :
- Sub-district :
- District/Town :
- Province :

2.6 How do you get your duck breeders?

- ☐ From own breeders
- ☐ Buy from other farmers around
- ☐ Buy from other areas, mention :
- ☐ Buy from the markets, mention :
- ☐ Others :

2.7 What is the age variation of the reared ducks?

- ☐ The same of age
- ☐ Different ages
- ☐ Others, mention :

2.8 How many age variations do you usually have?

- ☐ Two variations, mention:
- ☐ Three variations, mention:
- ☐ More than three variations, mention:
- ☐ Others, mention :

2.9 How do you treat the ducks in relation to their age?

- ☐ Mixed
- ☐ Completely separate them
- ☐ Others, mention:

2.10 How do you treat new ducks?

- ☐ Firstly separate them from the old one
- ☐ Mix them with the old ones
- ☐ Others, mention :

2.11 If you separate them, how do you do that?

- ☐ Inside special confinements isolated from the others
- ☐ Inside special confinements next to the others
- ☐ Partitioning the confinements
- ☐ Others, mention :

Management system

2.12 How do you feed your ducks?

- ☐ Herding them
- ☐ Herding them and giving additional feed
- ☐ Others, mention :
.....

2.13 How old are your ducks when you start giving additional feed?

..... weeks

2.14 What kind of additional feed do you give?

- ☐ Industrial feed
(Name of the factory:;
Price:/.....)
- ☐ Waste fish
- ☐ Restaurant/Household cooking waste
- ☐ Crop residue
- ☐ Self made, mention :
.....
- ☐ Others, mention
.....

2. 15 How many times and when is the additional feed given?

- ☐ Once, at :
- ☐ Twice, at :
- ☐ Others, mention :
.....

Herding System

2.16 At what age do your ducks start to be herded?

.....

2.17 Where do you usually herd your ducks?

- ☐ Rice-fields
- ☐ Beach
- ☐ River-banks
- ☐ Unused/Abandoned ponds
- ☐ Along canals/drains/ditches
- ☐ Others, mention :
.....

2.18 When do you usually herd your ducks?

- ☐ All seasons/not depending on seasons
- ☐ Rainy season
- ☐ Dry season
- ☐ Following harvest of rice-fields
- ☐ Others, mention :
.....

2.19 How often do you herd your ducks?

- ☐ Everyday
- ☐ Once in two days
- ☐ Once in three days
- ☐ Uncertain time, mention :
.....
- ☐ Others, mention
.....

2.20 At what time do you usually start and finish herding your ducks?

Start	Finish	Notes
At :	At :

2.21 What kind of feed do your ducks eat in the herding areas?

- ☐ Waste of paddy-harvest
- ☐ Dehulled rice/grain
- ☐ Snails
- ☐ Small fish
- ☐ Worms
- ☐ Others, mention :
.....

2.22 How far are the ducks herded?

- ☐ Within the village (from one area to another)
- ☐ Within the sub-district (from one village to another)
- ☐ Within one district (from one village to another – across sub-districts)
- ☐ Within one province (from one village/sub-district to another village/sub-district – across districts)
- ☐ Across the province
- ☐ Others, mention:
.....

2.23 How do you move the ducks?

- ☐ By trucks or other vehicles
- ☐ Driving them along
- ☐ Carrying them on shoulder using the basket
- ☐ Mixed in many ways, mention :
.....
- ☐ Others, mention :
.....

2.24 Along the travel, do you ever pass or stay for a while at other herding areas/farms? (chicken, geese, pigeons, sheep, cows, buffaloes, etc)

- ☐ Yes, kinds of animal :
.....
- ☐ No
- ☐ Others, mention :
.....

2.25 If 'yes', are your ducks herded along with the animals in the same area?

- ☐ Yes
- ☐ No

2.26 How do you get the herding areas?

- ☐ Rent
- ☐ Not rent
- ☐ Others, mention :
.....

2.27 If you rent it, how much do you usually pay for it?
per

Confinements

2.28 Do you build confinements for your ducks?

- ☐ Yes
- ☐ No

2.29 What types of confinement do you build?

- ☐ Permanent
- ☐ Non-permanent, made from:
.....
- ☐ Others, mention :
.....

2.30 Give description of the permanent confinements (cross unnecessary words)

- ☐ Roof without walls, with yard – pond – fence
- ☐ Individual/colony confinements, with yard – pond – fence
- ☐ Individual/colony confinements above the pond
- ☐ Individual/colony confinements
- ☐ Others, mention :
.....

2.31 Concerning non-permanent confinements, how do you treat the old confinements?

- ☐ Throw away
- ☐ Sell
- ☐ Reuse for new confinements
- ☐ Others, mention :
.....

2.32 What density do you use when you build the confinements?

..... heads per m xm
..... heads per confinement

Labour Input

2.33 Who runs the farm?

- ☐ Yourself
- ☐ The family
- ☐ Neighbours
- ☐ People from other villages
- ☐ Others, mention :
.....

2.34 How many workers handle the ducks?

- ☐ 1-3 workers
- ☐ 4-10 workers
- ☐ More than 10 workers

2.35 Where do the workers live?

- ☐ Nearby the confinements
- ☐ In your house
- ☐ In their houses
- ☐ Others, mention :
.....

2.36 Do you pay them?

- ☐ Yes
- ☐ No

2.37 If 'yes', what is the average monthly wage?

- ☐ < Rp500, 000
- ☐ Rp500,000 - Rp1,000,000,-
- ☐ > Rp1,000,000

III. PRODUCTION SYSTEM

3.1 Main purpose of the duck farming:

- ☐ Egg
- ☐ Meat
- ☐ Mixed
- ☐ Breeding (to obtain breeder)
- ☐ Others, mention :
.....

Egg production

3.2 As for layer ducks, what is the egg production of your ducks?

-eggs per day

3.3 At what age do your ducks usually start to lay eggs?weeks

3.4 At what age do your ducks enter culling period? weeks

3.5 Where are the eggs usually laid?

- ☐ Inside the confinement
- ☐ Outside the confinement, on the yard
- ☐ In the herding area
- ☐ Others, mention :
.....

Meat production

3.6 As for meat ducks, what is the duck weight when you sell?

-kg/ head

3.7 At what age are the ducks usually sold?

..... weeks

Breeding system

3.8 As for breeding ducks, what is the percentage of eggs to be hatched?

.....%

3.9 What is the percentage of the hatched eggs?

.....%

3.10 How do you hatch the eggs?

- ☐ Have them hatched naturally
- ☐ Use incubator
- ☐ Others, mention :
.....

3.11 What do you do to the unhatched eggs?

- ☐ Consume
- ☐ Sell
- ☐ Throw away
- ☐ Mixed
- ☐ Others, mention :
.....

Other Products

3.12 What do you do to the ducks' faeces?

- ☐ Throw away
- ☐ Use as Manure
- ☐ Sell as manure
- ☐ Give to other people
- ☐ Others, mention :
.....

3.13 What do you do to the ducks' feathers after cutting them off?

- ☐ Sell
- ☐ Throw away
- ☐ Give to other people
- ☐ Others, mention :
.....

IV. HEALTH MANAGEMENT

4.1 Animal Health Programme for the duck :

Activity	Yes	No	Kind of product/ Vaccine Name	Diseases	Age when given
Vaccination					
Anthelmenthicum /Deworming					
Antibiotic					
Vitamin					

4.2 From where do you get the information on Animal Health Programme for your ducks?

- ☐ Veterinarians from the Animal Health Post
- ☐ District officers/District animal health service officers
- ☐ Other farmers
- ☐ Others, mention :

.....

4.3 Who conducts the Animal Health Programme for your ducks?

- ☐ Veterinarians from Animal Health Post
- ☐ District officers/District animal health service officers
- ☐ Yourself
- ☐ Others, mention :

.....

4.4 How do you treat sick ducks?

- ☐ Slaughter
- ☐ Sell
- ☐ Give medications
- ☐ Do nothing
- ☐ Others, mention :

.....

4.5 What diseases are usually found in your ducks?

- ☐ Diarhea
- ☐ Cough/Sneeze
- ☐ Loss of appetite
- ☐ Paralysis
- ☐ Others, mention :

.....

4.6 Besides industrial medications, have you ever used self-made traditional medications?

- ☐ Yes, mention :
.....
- ☐ No
- ☐ Others, mention :
.....

4.7 What do you do to dead ducks?

- ☐ Burn
- ☐ Bury
- ☐ Throw away
- ☐ Do nothing
- ☐ Sell
- ☐ Consume
- ☐ Processed into fish-feed
- ☐ Others, mention :
.....

4.8 What do you do in case a high mortality occurs to your ducks?

- ☐ Report to the animal health service officers/ Animal Health Post
- ☐ Handle by yourself
- ☐ Others, mention :
.....

4.9 What is the average monthly mortality percentage?

..... percent

4.10 What kind of disease is the main cause of the death?

- ☐ Diarrhea
- ☐ Loss of appetite
- ☐ Cough/Sneeze
- ☐ Paralysis
- ☐ Others, mention :
.....

4.11 Do you clean the confinements or the yard where your ducks live?

- ☐ Yes
- ☐ No

4.12 If 'yes', how often do you do it?

- ☐ Twice a day
- ☐ Every day
- ☐ Every 2 days
- ☐ Every 3 days
- ☐ More than every 3 days
- ☐ Others, mention :
.....

4.13 How do you clean up the confinements?

- ☐ Sweeping
- ☐ Sweeping and applying disinfectant
- ☐ Others, mention :

.....

V. MARKETING SYSTEM

5.1 To whom do you sell the output of your duck?

- ☐ Collectors
- ☐ Middlemen
- ☐ Directly to the customers
- ☐ Others, mention :

.....

5.2 Where do the buyers come?

- ☐ From other areas in the village/from other villages
- ☐ From other sub-districts/districts
- ☐ From other provinces
- ☐ Others, mention :

.....

5.3 How do the ducks and their products come to the buyers?

- ☐ You deliver them
- ☐ They fetch them
- ☐ Others, mention :

.....

....., 2006

Remark :

Farmer	Enumerator

Annex 3:

RESULT OF QUESTIONNAIRE FOR DISTRICT OFFICER

Number of animal health service officers, animal health facilities and animal markets in each district of survey:

No	Number (person / each)	Districts				
		Pemalang	Brebes	Cirebon	Subang	Tangerang
A	Animal Health Service Officers					
1	Veterinarian	2	3	5	1	6
2	Para vet	13	11	14	16	7
3	Extension worker	14	18	8	22	-
B	Animal Health Facilities					
1	Car	1	2	6	1	-
2	Motor cycle	11	30	22	2	1
3	Cold Chain					
	* Refrigerator	6	8	3	6 + 2 Freezers	7
	* Ice box	14	12	-	2	26
4	Injection Equipment					
	* Standard	10	-	Yes	13	30
	* Disposable	300	-	Yes	3.000	-
5	PPE (Personal Protective Equipment)					
	* Boots	20	20	Yes	2	5
	* Gloves	50	-	Yes	100	5
	* Maskers	29	-	Yes	5	-
	* Glasses	20	-	Yes	5	-
	* Laboratory uniforms	14	-	Yes	2	5
	* Caps	20	-	Yes	1	-
C	Animal Markets	14	6	4 (in the sub-districts of Aryawinangun, Klangeran, Weru, Ciledug/Pabuaran)	10	None (Only local market / seasonal markets that are not managed by district authorities)

Areas with AI Cases Recorded :

No	District (Sub-district)	Village infected	Kind of fowls infected	Time of occurrence	Sub-districts where the questionnaire survey was conducted
1	PEMALANG				
	a. Petarukan	Klareyan	Quail	2004	1. Taman (Vill. Sitemu)
		Pegondan	Quail	2004	2. Petarukan (Vill. Bulu)
	b. Bodeh	Pendowo	Quail	2004	3. Randudongkal
	c. Taman	Kabunan	Broiler	2004	
	d. Ampel Gading	Blimbing	Broiler	2004	
	e. Comal	Purwosari	Quail	2004	
	f. Pemalang	Pelutan	Broiler	2004	
2	BREBES				
	a. Paguyangan		Layer	Aug 2003 – March 2004	1. Bumiayu
					2. Brebes
					3. Wanasari
3	CIREBON				
	a. Palimanan	Semplo	Layer	Dec 2004	1. Gebang
					2. Losari
					3. Kapetakan
4	SUBANG				
	a. Kalijati	Marengmang	Muscovy duck	Jan - 2006	1. Pusaka Nagara (Vill. Rancadoka, Sarmaja, Sukamulya, Karangsari, Pusakaratu, Bojong Tengah)
	b. Subang	Pasir-Kareumbi	Cemani chicken	Dec – 2005	2. Binong (Vill. Citrajaya)
	c. Ciasem	Ciasem-Girang	Native chicken	Jan – 2006	3. Comprang (Vill. Suka tani, Suka seneng, Bojong kedeng, Kalensari)
	d. Pamanukan	Bongas	Native chicken	Feb – 2006	
	e. Cipunagara	Kosambi	Native chicken Muscovy duck	Jan – 2006	
	f. Comprang	Kiarasari	Native chicken Muscovy duck	Jan – 2006	
	g. Pusakanagara	Rangdu	Native chicken	Jan – 2006	
	h. Cipeundeuy	Lengkong	Native chicken	Jan – 2006	
5	TANGERANG				
	a. Legok		Broiler & Layer	2003	1. Sepatan
	b. Panongan		Broiler & Layer	2003	2. Mauk
	c. Curug		Broiler & Layer	2003	3. Pakuhaji
	d. Pagedangan		Broiler & Layer	2003	
	e. Kemiri		Broiler & Layer	2003	
	f. Rajeg		Broiler & Layer	2003	

General problems found in duck farming in each district and the associated responses:

No		Pemalang	Brebes	Cirebon	Subang	Tangerang
1	General problems	<ol style="list-style-type: none"> 1. Supply of feed 2. Supply of capital 3. Low awareness and knowledge 	<ol style="list-style-type: none"> 1. High prices of feed 2. Low prices of egg 3. Low amount of capital (difficulties in capital access) 4. Markets controlled by middlemen / brokers / collectors 5. Uncertain supply of fresh fishes from the sea for duck feed 6. Low acceptance of farmers to apply technology 	No big problems in general; problems then were difficulty in getting hatched eggs and the delay in distributing DODs outside Java	<ol style="list-style-type: none"> 1. Wide distribution of duck farmers 2. Extensive duck farming system 	Traditional / backyard system, and free range relying on the sources of feed (harvested rice-running system)
2	Responses	<ol style="list-style-type: none"> 1. Providing capital with low interest 2. Visiting farmers in person 3. Holding presentations to raise public awareness 4. Providing training 	<ol style="list-style-type: none"> 1. Continuing education for farmers / group of farmers 2. Strengthening in capital side 3. Provide trainings for farmers 4. Transferring useful applied technology 5. Increase the independency of group of farmers 	<ol style="list-style-type: none"> 1. Being more selective in farmer groups' production 2. Paying extra attention to duck sex ratio for hatching purposes 3. Temporarily suspending hatchery 	Raising public awareness	Recommending more intensive duck farming systems

Experience in Avian Influenza Cases :

No	Description	Pemalang	Brebes	Cirebon	Subang	Tangerang
1	AI cases in the district	Yes	Yes	Yes	Yes	Yes
2	Basis for such conclusion	Symptoms and laboratory diagnosis	Symptoms and laboratory diagnosis	Symptoms and laboratory diagnosis	Symptoms and laboratory diagnosis	Symptoms, laboratory diagnose and pathology-anatomy diagnosis
3	Availability of laboratories for AI diagnosis	No	No	No	No (Only for rapid test and pathology-anatomy diagnose)	No
4	Where to go for AI diagnosis	Disease Investigation Centre/DIC (BPPV Wates, the province of Jogjakarta)	DIC (BPPV Wates, the province of Jogjakarta)	Animal Health Laboratory of Livestock Department (Province of West Java)	Research Institute of Animal Diseases and Veterinary Public Health / Animal Diseases Center (Cikole, Lembang).	Research Institute of Veterinary Science (Bogor), DIC (BPPV Wates, the province of Jogjakarta)
5	Time between sending the samples and obtaining the results	14 days	2 days	6 days	3-6 days	± 15 days
6	Actions when AI cases are found	a. Doing clinical diagnosis b. Doing - anatomy diagnosis c. Taking blood samples and sending them to DIC	Implementing the 9 strategic steps to control AI (Decree of the Director General of Livestock Services of Indonesia)	1. Doing the good biosecurity 2. Vaccinating healthy fowls 3. Stamping out (depending on farmers' condition and conciousness 4. Doing surveillance	1. Slaughtering the infected fowls 2. Vaccinating healthy fowls 3. Conducting environment disinfection programme 4. Socializing information on Avian Influenza	1. Isolating infected areas 2. Disinfectin farms 3. Vaccinating healthy fowls 4. Destroying dead fowls (burning / burying)
7	Presence of Standard Operating Procedure to handle AI cases	No	Yes	Yes	Yes	Yes (Decree of The Director General of Livestock Services of Indonesia No.17/Kpts/PD. 640/F/02.04)
8	Problems found during the implementation of the SOP	No laboratories for AI diagnosis	None	1. Lack of infrastructure and equipment 2. Lack of operational fund 3. Lack of man power	1. Traditional / extensive husbandry system 2. Lack of equipment, transportation and man power / vaccinators 3. Lack of public participation because of the poor knowledge of AI	Lack of compensation fund

Experience in Avian Influenza Cases:

No	Description	Pemalang	Brebes	Cirebon	Subang	Tangerang
9	Measures having been taken to prevent the infection / reinfection of AI in the district	1. Better biosecurity 2. Vaccination 3. Control of poultry movement 4. Public awareness raising 5. Monitoring and evaluation	1. Better biosecurity 2. Vaccination 3. Control of poultry movement 4. Public awareness raising	1. Socialization of AI 2. Biosecurity 3. Vaccination 4. Control of poultry movement	1. Vaccination 2. Disinfection 3. Socialization of AI 4. Forming of animal health community workers	1. Better biosecurity 2. Control of poultry movement 3. Disinfection 4. Vaccination 5. Socialization of AI
10	Vaccination for public poultry	Yes	Yes	Yes	Yes	Yes
11	Frequency of the vaccination	Twice	Twice	3 times	3 times	3 times
12	Facilities supporting the vaccination: 1. Refrigerator 2. Cooler box/ 3. Vaccine temperature gauge	Yes Yes No	Yes Yes No	Yes Yes No	Yes Yes Yes	Yes Yes No
13	Slaughtering of the infected animal	Yes	Yes	No	Yes	No
14	Poultry to be slaughtered	All birds in the same cage with the infected birds	All birds in the same cage with infected bird	-----	Infected birds only	-----
15	Compensation for the slaughtered animals	Yes	No (the slaughtering program was informed only after March 17, 2004; districts had done the slaughtering prior to the issue of the legislation; all were done due to public awareness)	-----	No	-----
16	Average compensation	Rp3,000/broiler Rp1,000/quail	-----	-----	-----	-----
17	Source of compensation fund	Central government	-----	-----	-----	-----

Annex 4:

FIELD ACTIVITY PICTURES



Picture 1. Pre survey of free range duck study



Picture 2. Pre survey to farmers groups (*kelompok ternak*)



Picture 3. Conversation with farmers during the pre survey



Picture 4. Collection of secondary data from district officers



Picture 5. Free range-scavenging ducks in rice fields



Picture 6. Free-range ducks in rice fields



Picture 7. Free range-scavenging ducks with non permanent confinements (plastic net)



Picture 8. Non permanent confinements of free range-scavenging ducks next to rice fields



Picture 9. Rows of non permanent confinements of free range-scavenging ducks



Picture 10. Rows of non permanent confinements of free range-scavenging ducks



Picture 11. Free range ducks with additional feed



Picture 12. Free range ducks with additional feed



Picture 13. Water canals as herding area for free range ducks



Picture 14. Free range ducks are herding on the river



Picture 15. Free range ducks in an enclosed confinement with daily feeding and no herding



Picture 16. Water facility in an enclosed confinement of free-range ducks with daily feeding and no herding



Picture 17. Chopped fishes as additional feed



Picture 18. Blended fishes as additional feed



Picture 19. Bran as additional feed



Picture 20. Duck eggs collected in the farm



Picture 21. Duck eggs collected in a farmers group



Picture 22. Local ducks as majority breeds by the respondents



Picture 23. Contact with other animals



Picture 24. Conversation with district officers on ducks – avian Influenza case



Picture 25. District officer questionnaire filling process



Picture 26. Farmer questionnaire filling process

