THESIS

ASSESSMENT OF THE INTRODUCTION AND SPREAD OF HIGHLY PATHOGENIC AVIAN INFLUENZA (H5N1) IN THAILAND: APPLICATION OF MARKET CHAIN ANALYSIS OF POULTRY AND THE USE OF COMMUNITY-BASED DISEASE PREVENTION STRATEGIES

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ABSTRACT

ASSESSMENT OF THE INTRODUCTION AND SPREAD OF HIGHLY PATHOGENIC AVIAN INFLUENZA (H5N1) IN THAILAND: APPLICATION OF MARKET CHAIN ANALYSIS OF POULTRY AND THE USE OF COMMUNITY-BASED DISEASE PREVENTION STRATEGIES

An analysis of the market chain and trade pathway for the small poultry production system was conducted in Ban Klang Subdistrict, Nakhon Phanom Mueang District, Nakhon Phanom Province, Thailand. The aim of the study was to determine the risk of highly pathogenic avian influenza (HPAI/H5N1) introduction and transmission along the poultry market chain, and then apply a community-based approach to prevent the introduction and spread of H5N1 along the identified chain. The focus was on the layer market chain because an outbreak of HPAI was reported 24 July 2006 at a layer farm in Banklang Subdistrict. Six human patients were suspected to be infected with Avian Influenza virus (AI), but no cases were reported after the surveillance was initiated (MOPH 2006). A cross-sectional analysis method was used to identify the poultry market chain and assess the risk of introduction and transmission of AI along that chain. For linking actors along the poultry market chain, the snowball sampling method was used. The data were collected by using a structured questionnaire and applying focus discussion group activity (FDG), which is part of the community-based approach, to the high-risk actors in the poultry market chain. Participants' level of knowledge, attitude and practice behaviors (KAP) regarding AI was assessed, as well as the risk of AI in the poultry market chain. From three layer product pathways—eggs, spent hens and disposal of layer manure—the findings demonstrated that the spent hens and disposal of layer manure are higher-risk pathways for the introduction and

transmission of HPAI than the egg products pathway. The farmers (producers) have the highest risk of contracting the AI virus because of their constant proximity to poultry, while traders have the highest risk of transmitting the AI virus along the layer market chain as their business requires moving from farm to farm. A survey of KAP regarding AI showed that the majority of farmers had a high level of knowledge and positive practice behaviors. This was compared to traders where more than half had only moderate to low knowledge, and positive practice behaviors. The majority of farmers and traders, however, had a positive attitude toward policies of prevention and control of HPAI through a surveillance system in their community. The FDG demonstrated that other actors expected an efficient HPAI prevention system at the producer level. The results of this study showed that community involvement in an HPAI surveillance system should be considered for all related actors in the poultry market chain. In order to be effective, the policies should be followed and periodically monitored for compliance.

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CHAPTER I

INTRODUCTION

1.1 Rationale for the study

Outbreaks of highly pathogenic avian influenza (HPAI) subtype H5N1 have affected the economies of several countries, including Thailand. The presence of HPAI directly affected the international trade of live birds and poultry meat products, and indirectly affected tourism (Rushton et al. 2005). Thailand had direct losses of 29 million birds, 14.5% of the poultry population in the first wave of HPAI outbreak during 23 January 2004 - 24 May 2004. An outbreak in 2003-2004 resulted in the loss of about 1.5% of GDP growth over the year (McLeod et al. 2005). Within the country, the farmers' livelihood, commercial poultry products, human health and tourism were adversely affected by the outbreaks (Kasemsuwan et al. 2008). During the period 2004 - 2008 there were six major epidemics of H5N1 that occurred in Thailand (Amonsin et al. 2008). The first outbreak occurred at a layer farm in Suphanburi Province, located in the central part of the country, followed by scattered outbreaks which extended into the eastern part of Thailand (Tiensin et al. 2007). The first confirmed human and poultry cases of H5N1 were reported there on 23 January 2004 (FAO 2007). There have been a total of 25 confirmed cases of human H5N1 in Thailand, 17 of which have been fatal (FAO 2011). The last human case was reported on 27 September 2006 (WHO 2012), while the last reported outbreak in poultry in that country was on 17 November 2008 (FAO 2011). Animals affected by H5N1 to date have been domestic poultry and wild birds, along with tigers that were fed fresh H5N1-infected chicken carcasses (Yee et al. 2009).

The Thai Department of Livestock Development (DLD) implemented several strategies after the first outbreak, such as comprehensive stamping out of infected poultry flocks, restricting poultry movement, banning free-grazing duck feeding, improving farm biosecurity and hygiene, as well as intensive surveillance to prevent the spread of the disease in domestic—both commercial and backyard—poultry flocks (Eagles et al. 2009, Kasemsuwan et al. 2008, Prakarnkamanant et al. 2010). For instance, authorities used a surveillance program in live bird and food markets in central Thailand during July 2006 through August 2007 (Amonsin et al. 2008). If H5N1-infected birds were discovered, they eradicated those flocks and conducted cleaning, disinfection and screening around the quarantined areas. Also in place were surveillance strategies, such as movement control in zoning areas. This strategy was used primarily because live birds and live poultry markets (wet markets) have been shown to play a major role in the reemergence of influenza and some other respiratory diseases (Liu et al. 2003, Wang et al. 2006, Webster 2004).

The community-based method is an effective approach that has been used to control serious diseases in several countries. The principles behind this method include the participation of community members in the design and implementation of the program that is to take place in their community. This concept is successful because community problems are best addressed by the persons directly affected and have intimate knowledge of the decisions. For example, in the USA community-based programs have been used for the prevention and control of cardiovascular diseases (CVD) since 1970 (Nissinen et al. 2001); Tanzania used community-based animal health workers to strengthen the national disease surveillance system (Allport et al. 2005); and Puerto Rico, Thailand and Indonesia use community-based prevention programs for Dengue hemorrhagic fever (Adisasmito 1995, Therawiwat et al. 2005, Winch et al. 2002). In

addition, in 2006 Thailand developed a community-based program to prevent avian influenza (AI) in the Province of Suphanburi where many outbreaks of this disease had occurred (Maton 2006).

Community-based surveillance in Thailand has been instituted through the government sector surveillance network. More than 100,000 public health and veterinary volunteers are involved in the network at the village level. This level of surveillance has been an important part of the successful prevention and control of HPAI in Thailand (WHO SEARO 2007). This success shows that community-based programs should be encouraged to improve community participation in disease surveillance, and can enhance the effectiveness of any prevention and control program.

Movement of animals, animal products, and humans within and between countries increases the risk for spread of HPAI virus, and the trade of live birds creates the highest risk (Berg 2009). In order to have practical ways to prevent, control and eradicate this disease, a greater understanding of the movement of live birds through all levels of the poultry market is needed. This requires analyzing the market and the flow of poultry starting with the producers (farmers) and ending with the consumers. The poultry supply chain in Thailand can be categorized into three sectors: small backyard producer, medium size poultry contractor, and large industrial producer (Heft-Neal et al. 2008).

Nakhon Phanom Province is located in northeast Thailand approximately 740 kilometers from the capital city of Bangkok. The northeast side of the province borders Khammouan and the Tha Khaek district in Lao PDR across the Mekong River. An outbreak of HPAI was reported 24 July 2006 at a layer farm in Banklang Subdistrict (Tambon), Nakhon Phanom Mueang District in Nakhon Phanom Province. Of the 5500 layers in two infected farms, 2241 died from HPAIV

infection and the remaining chickens were destroyed in an attempt to contain the outbreak (OIE 2006). At the time, only infected flocks were tagged for culling; there was no pre-emptive culling because of a government policy revision in previous years (Heft-Neal et al. 2009). As a result, the DLD had to destroy nearly 400,000 live chickens, about 350,000 eggs and more than 150,000 kilograms of animal feed to finally control this outbreak. This outbreak impacted not only the animal population, but also the health of the human population. A total of six human patients were suspected to be infected with avian influenza virus, but no cases were reported after the surveillance was initiated (MOPH 2006).

After the outbreak, intensive surveillance using various tools, such as the cloacal-swab test in poultry every two months and spraying disinfectant at least three times a year within an AI outbreak area, have been used in a collaborative effort between the Nakhon Phanom provincial livestock officer and various communities, particularly at Tambom Ban Klang (Duangjinda et al. 2009).

Several characteristics of Tambon Ban Klang are of interest for this market chain analysis using a community-based approach. For instance, since Ban Klang borders Khammouan, Lao PDR, cross-border trade can be included in the poultry market chain analysis. The Food and Agriculture Organization of the United Nations (FAO) believes that cross-border trade continues to carry a significant risk for spreading the lethal virus (FAO 2012). The outbreak in 2006 clearly illustrated that communities like Ban Klang need to be concerned about improving biosecurity and establishing an effective surveillance system.

The purposes of this research project were to: (1) describe and analyze the poultry market chain by focusing on backyard or small semi-industrial farms, which includes almost 98% of poultry producers in Thailand (Heft-Neal et al. 2008) and (2) design an appropiate strategy to

prevent the introduction and spread of HPAI along the chain. In order to develop practical ways to prevent, control and eradicate HPAI, a greater understanding of the movement of live birds through all levels of the poultry market is needed because movement of animals, animal products, and humans within and between countries increases the risk for spread of HPAI virus, with the trade of live birds creating the highest risk (Berg 2009). This requires analyzing the market and the flow of poultry starting with the producers (farmers) and ending with the consumers. This study uses a Knowledge, Attitudes and Practice (KAP) survey which is a part of community-based approach to collect more information for each actor in the poultry market chain with regard to HPAI. This is important because unwise policies which disrupt livelihoods may inadvertently increase the risk of spread of the disease through underground and intensified production (Helf-Neal et al. 2009).

1.2 Objectives of the study

The three-fold objectives of this study were to:

1. Describe the poultry market chain and trade pathways for layer producers in Ban Klang Subdistrict and surrounding areas.
2. Analyze the link between the poultry market chain pathways in relation to the potential for introduction and spread of HPAI.
3. Determine the risk of HPAI introduction and transmission along the poultry market chain using a community-based approach (CBA).

1.3 Background and significance

Although most of the poultry products delivered to consumers in Thailand come from industrial producers, backyard producers make a significant contribution of broilers to the local market (Heft-Neal et al. 2009). After the HPAI outbreak in 2004, biosecurity was the most common concern regarding the control and prevention of this disease along all poultry supply chains. Industrial producers have done much to adhere to rigorous standards for biosecurity; however, backyard farms apply little or no biosecurity measures. As there are more than 10,000 backyard farms in Thailand, this lack of biosecurity represents a significant risk for new AI outbreaks.

Nakhon Phanom Province, which is located in northeastern Thailand, is divided into 12 districts. Four districts are along the border between Thailand and Lao PDR including Nakhon Phanom Mueang District (number 1), Tha Uthen District (number 3), Ban Pheang District (number 4) and That Phanom District (number 5). Across the Mekong River, these four districts connect with the Khammouane Province of Lao PDR.

Nakhon Phanom Mueang District is located in the most eastern part of Nakhon Phanom Province. This district is further subdivided into 15 Tambons. Tambon Ban Klang is located about 26 kilometers south of the center of Nakhon Phanom Mueang District. There are 13 villages in Tambon Ban Klang. In 2010, this subdistrict had a total population of 8,662 (3,327 males, 4,325 females) within 1,729 households.

This Tambon was selected for this study for several reasons. First, Nakhon Phanom Mueang District has the largest poultry population in the province, especially in Tambon Ban Klang where nearly 97 percent (155,433/160,287) of the total layer population is raised (DLD

2010). The layer population in Tambon Ban Klang is, therefore, representative of layers in the entire province.

Second, due to the high proportion of layer farms in this Tambon, movement of poultry products satisfies the consumption demands of other areas which have smaller layer populations. The location is ideal because we can study the market pathway and market channels where poultry and poultry products are moved to other areas through cross-border trade.

Third, an outbreak of HPAI occurred in Tambon Ban Klang in July 2006. At that time the entire layer population in the area was destroyed, as were other products such as eggs and poultry feed. In addition, six humans were suspected of being infected with the AI virus (MOPH 2006). Help from several organizations, including seminars on how to adjust farming practices and improve biosecurity, as well as financial support from banks, enabled layer farmers to resume production in 2007. The fact that the population of this region has a history of being directly impacted by HPAI makes it an excellent study area to apply a community-based approach to a system of intensive surveillance.

Lastly, layer farms in Tambon Ban Klang are typically conventional medium size or small size producers that have had low biosecurity and inadequate hygiene systems. Layers are raised under similar conditions in each farm. For example, the average layer population per farm is about 3,000 hens, where layers are raised within a free cage system in layer houses most commonly constructed of wood and bamboo. These farms are interesting examples of enhancing biosecurity and hygiene, while preserving the local culture and wisdom for raising layers in this Tambom.

For the reasons discussed above, we focused our study on the layer market chain including the live layer (spent hen) pathway, products of layers such as eggs, and by-products of

layers, such as manure. We analyzed each step in the supply chain from producer to consumer, as well as businesses or entrepreneurs related to the poultry market chain, to determine where the risk of introduction and transmission of AI lies. In addition, this study included cross-border trade, which is an important point of the risk assessment for this disease.

CHAPTER II

LITERATURE REVIEWS

2.1 Poultry industry in Thailand

2.1.1 Farm sector

According to the FAO, poultry production systems can be categorized into four possible sectors: 1) an industrial and integrated system, 2) a commercial poultry production system with moderate to high biosecurity, 3) a commercial poultry production system with low biosecurity, and 4) a village or backyard system (FAO 2004). In Thailand, three poultry production systems are in place, namely large scale industrial production, semi-industrial production, and smallholder backyard farming (Heft-Neal et al. 2008). For our study, the Thailand poultry production system was adapted to the FAO definition. This classification of the poultry industry is a worldwide standard mainly used to emphasize the level of biosecurity associated with the poultry operation. With the FAO definition in mind, the poultry production system in Thailand can be described by the following sectors:

Sector 1: An integrated industrial system that has complete control over any input or output into the system (e.g., feed mills, drugs, veterinary services, slaughter, and processing facility) with a high level of biosecurity. The end products are sent either to the export or urban markets. Industrial farms are only one percent of the total of poultry producers in Thailand but account for up to 70% of the total chicken production (Heft-Neal et al. 2008). Examples of industrial producers in Thailand include Charoen Pokphand (CP), Betagro (BP), and Laemthong Poultry Co.

Sector 2: Primarily medium-scale broiler and layer farms contracted to the industrial system. These farms have moderate to high biosecurity where the input and output is controlled by the contractor but managed by the farmer, and high-level technologies have been adopted. As the farms are located near the capital and other major cities, they mainly supply poultry products to the urban market with limited or no exports from this sector.

Sector 3: Commercial poultry production facilities having low to minimal biosecurity. The farmer purchases feed and other incoming supplies from a large-scale company. The poultry products are mainly for domestic consumption, particularly in rural areas, and the technology is moderate to low, sometimes using "local wisdom" to control costs. The farms are located in smaller towns and rural areas (e.g., small to medium-scale layer farms in Chachoengsao Province, Nakhon Phanom Province).

Sector 4: Village or backyard independent farms that raise chickens with minimal biosecurity, operating without any formal contract with other poultry subsectors. The poultry products are consumed locally in the rural area and are used primarily for household consumption, supplemental income and cock fighting. Although only 10% of the national poultry production is produced from this sector, the backyard farm accounts for 98% of poultry producers in Thailand (Heft-Neal et al. 2008).

2.1.2 Poultry supply chain

As indicated above, almost 90% of poultry products in Thailand are produced by sectors 1 and 2; however, these groups encompass only 1% of poultry producers. A study from Helf-Neal and colleagues (2008) showed that industrial farms have highly vertically integrated supply chains and, as such, have firm control of their inputs. There are animal replacement sources, such

as breeding farms, that import parent/grandparent stock to the hatchery, and one-day-old chicks (DOC) from the hatcheries can supply operations for all four sectors (Fallon 2001). Sector 1 companies also maintain their own feed mills, drug supply, and veterinary services. The outputs, live birds, are transported to a company slaughterhouse, and once slaughtered the birds and/or parts are sent to the company processing plant or a contract wholesaler. The primary markets for the outputs of these producers are exports, supermarkets, large volume restaurants, and urban areas (see Figure 1).

There are several types of contract farms in Thailand, but the inputs of all types are controlled by the larger industrial partner. Supplies, such as DOC and animal feed, are received from an industrial source. Therefore, these inputs are under the same high standard for biosecurity as the industrial producers. Also, some products (outputs) are contracted for export or sale in a premium urban market like a superstore; so, the contractors must meet the same food safety standards that the industrial poultry producers must achieve. Because of a high demand for broiler products to export, a higher ratio of broilers as compared to layer farms are under contract in the system. Layer products, both eggs and meat, are mainly for domestic consumption.

Although farm sectors 1 and 2 have a high probability for the spread of disease if an outbreak occurs due to the large poultry population and high density (Heft-Neal et al. 2008), advanced technology and a high level of biosecurity are used for inputs through outputs to reduce the risk of outbreak. After an outbreak of HPAI in 2004, producers in sectors 1 and 2 adapted new procedures and higher biosecurity into their system to meet the requirements of export markets and government policies established for control and surveillance of the disease.

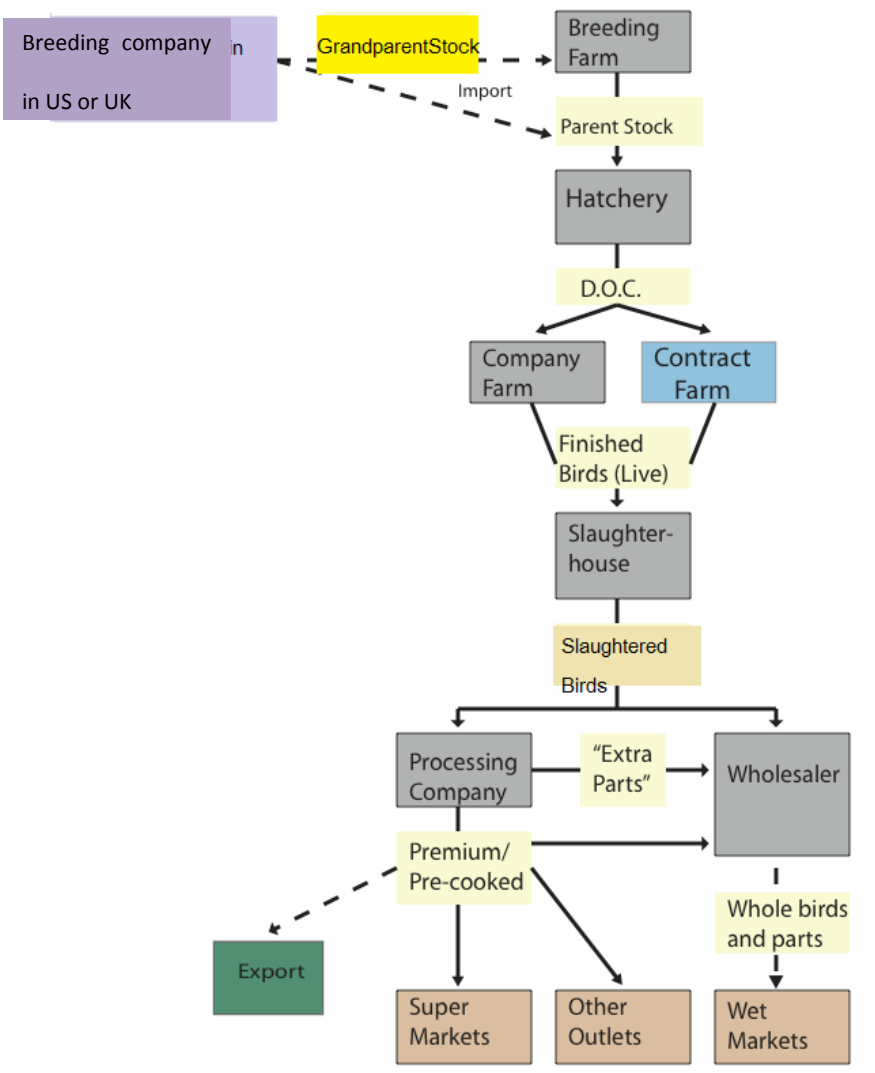


Figure 1. Vertically integrated supply chain.

Source: Helf-Neal et al., 2008

Small holder/village or backyard producers are ubiquitous in rural areas of Thailand. Poultry are raised primarily for household consumption, supplemental income, and cock fighting. There is low to minimal biosecurity in place due to the fact that producers are restricted by low profit margins and lack of access to capital. Since the HPAI outbreak in 2004, policies from the DLD to control and eradicate the disease have driven some backyard poultry producers to change

and raise other food animals. However, this poultry production sector is necessary for rural livelihoods, particularly in the extensive low-income rural population. A greater understanding of the supply chain in this sector could enable policy makers to design and implement policies that will have less negative effect on the backyard producers.

An audit of the supply chain by Helf-Neal (2008) and others in 2006 explained that there were two levels in the smallholder poultry supply chain, with the end user being the final stage no matter how many intermediaries come between. The first level is comprised of either the end user, aggregator, or market vendor. If the downstream flow goes through either an aggregator or market vendor in level 1, it can pass to either an end user or market vendor in level 2. Since the producer uses the poultry products for household consumption and providing supplemental income, he always plays the role of trader, processor, and consumer (end user of level 1). When the poultry production exceeds household demand, some producers sell their products to a local trader or directly to a market vendor. Live poultry are commonly sold by the producer to an aggregator, while processed poultry are sold to market vendors. In order to obtain a sufficient supply, local traders buy poultry products from several farms since each farm has only a small amount to sell. Some traders also play the roles of processor and market vendor (level 2). In the backyard system, the supply chain is more complex than in the industrial and large commercial system; each actor typically plays more than one role because there is a minimal quantity of poultry product flowing along the chain (see Figure 2).

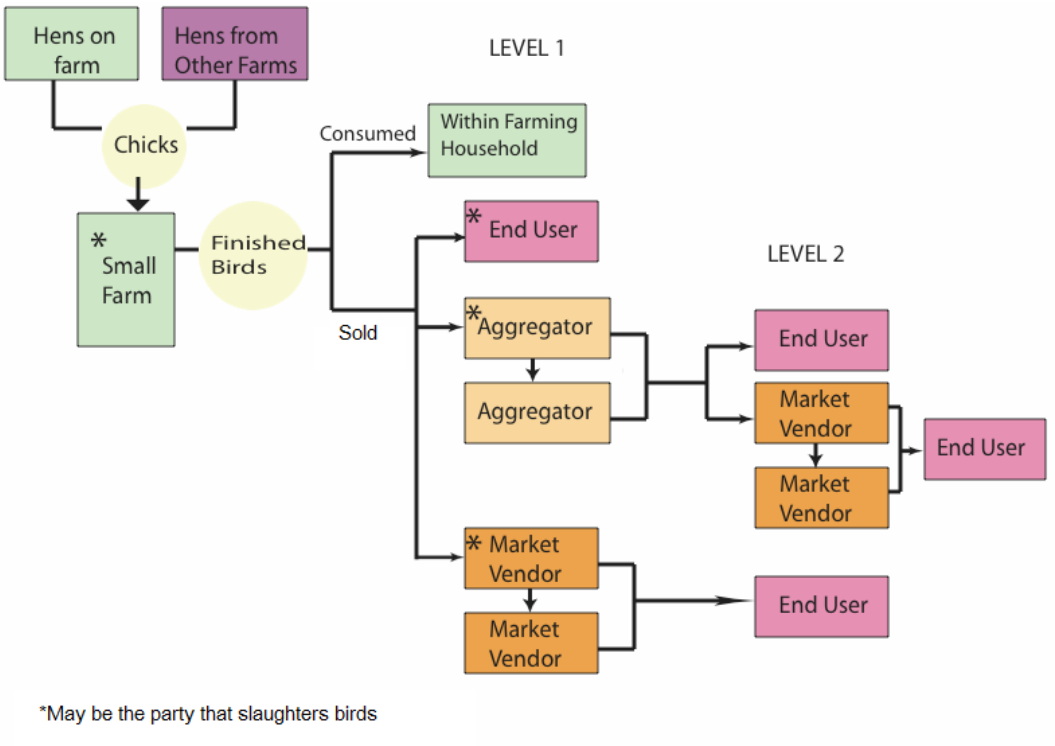


Figure 2. Independent farm supply chain.

Source: Helf-Neal et al., 2008

Helf-Neal et al (2009) also studied the variability in the indigenous smallholder poultry system in three provinces in Thailand, including Chaing Mai Province, Khon Kean Province and Nakhon Phanom Province. An outbreak of HPAI occurred in these three provinces in 2006. The study surveyed characteristics of each actor and factors affecting the flow of product in the smallholder supply chain. The results showed that, in these provinces, 80% of farmers raised fewer than 50 birds mainly for household consumption and supplement income. Almost all of the farmers (98%) replaced chicks using their own hens because they did not sell these lower-quality eggs in the local market. Live birds were the cheapest form of meat purchased by the aggregators or vendors, followed by whole dead birds; poultry sold in parts carried the highest price.

Aggregators typically bought larger quantities of poultry products from the farm than did the consumers.

The Helf-Neal study also showed that there were several differences in the smallholder supply chain among the three provinces. For instance, in Chaing Mai Province eighty percent of poultry farm products were sold to aggregators and market vendors, while in Khon Kaen Province 86% were sold directly to end users; in Nakhon Phanom Province the sales were split with 50% sold to market vendors and 40% to consumers. In Chaing Mai Province, aggregators sold approximately 76% of poultry products to consumers, while aggregators in Nakhon Phanom Province sold nearly 80% of poultry products to restaurants or shops. Eighty percent of broilers sold in Nakhon Phanom Province were purchased from nearby Mukdahan Province by the aggregators. Interestingly, there was no contract farm in Nakhon Phanom Province.

Furthermore, Helf-Neal and his colleagues discovered that in Nakhon Phanom Province less than 5% of the farmers questioned in the study had experienced culling of their flock, and less than 10% of their total flock was culled. This indicated that, during the HPAI outbreak, poultry tended to be hidden on the farm or temporarily moved to another location at culling time. This evidence illustrates the importance of community participation to achieve adequate disease control or eradication. Reluctance to be fully involved in the solutions will lead to future problems.

For commercial production systems with low to minimal biosecurity, the supply chain is a mixed pattern of contract farms and backyard farms. Farmers get feed and animal replacements, such as DOC, from the industrial system, while independently selling their output products. These farms produce a moderate quantity of products which are sold to satisfy consumption demands in the local markets. Depending upon their skills, an actor in this system

may prefer to play one role or many roles. However, farms in this system differ according to poultry type and rural livelihood in each area as farmers strive to reduce costs. For instance, an integrated farming system of housing poultry in a raised house above a fish pond takes care of the poultry manure disposal.

A thorough understanding of the poultry production system in each area will help policy makers to have more effective disease control policies for HPAI with less negative impact on the livelihoods of poultry producers. Our study focuses on layer farms because, if an outbreak were to occur, the supply chain of layer farms would be affected more since layers have a longer lifespan than broilers.

2.2 Avian Influenza as infection and the situation in Thailand

2.2.1 Avian Influenza Virus

Influenzavirus A, one of three genera of Influenza viruses in the *Orthomyxoviridae* family, is highly infectious to mammalian species, birds and humans (Swayne and King 2003). This virus is a major concern in both the public health and veterinary medical arenas because this strain is highly variable and evolves to cause mild to severe disease.

At present, sixteen Hemagglutinin (HA) subtypes (H1-H16) and nine Neuraminidase (NA) subtypes (N1-N9) of influenzavirus A have been identified by surface glycoprotein (Fouchier et al. 2005, Swayne and King 2003). There are more than 140 combinations of proteins possible for HA and NA. Only influenza A virus infects birds; it is often called “avian influenza virus” (Maton 2006). The avian influenza virus (AI) is classified as either low pathogenic (LPAI) or highly pathogenic (HPAI). To date HPAI has been only of the H5 and H7 subtypes, but not all H5 and H7 viruses are HPAI (Alexander 2007). Following the discovery of

LPAI in poultry, it was also noted that LPAI mutated to HPAI, showing that animal health officers also need to be concerned about LPAI (Alexander 2007, Maton 2006).

2.2.1.1 Evolutionary Options of Avian Influenza Virus

There are two main mechanisms of evolutionary change in influenza viruses, antigenic drift and antigenic shift. The antigenic drift mechanism, a continuous process with small changes in the virus, is less visible in AI, while it generally is apparent in human influenza viruses (Manuguerra et al. 2000). With antigenic shift, major change/re-assortment occurs with gene segments of the influenza viruses, resulting in a new influenza subtype that may cause a pandemic in the naïve human population (Maton 2006). Both antigenic drift and antigenic shift mechanisms occur in influenzavirus A.

2.2.1.2 Host Susceptibility of Avian Influenza Virus

Although certain subtypes of influenza A viruses affect specific species, influenzavirus A can cross over to other species. For example, in 1998 the H3N2 subtype of influenza A virus was introduced to swine from humans. In previous years only H1N1 viruses circulated within the US pig population (Maton 2006). In 1997, HPAI (H5N1) viruses crossed from birds to humans (Forrest and Webster 2010). However, gallinaceous poultry, such as chickens, turkeys, peafowl and quail, have higher susceptibility to HPAI than humans (Forrest and Webster 2010).

Susceptible birds infected with AI may or may not show clinical signs. Some birds, such as waterfowl and shore birds, are reservoirs where LPAI can replicate and be shed into the environment often without signs of disease (Yee et al. 2009). Likewise, ducks can carry and shed HPAI virus for long periods without clinical signs.

Due to their migratory behavior, waterfowl and shore birds may spread LPAI which could then adapt to HPAI in domestic poultry worldwide. These birds may also exchange the virus to other populations (Aviaire 2010). Free-grazing ducks in Thailand have been prohibited since the first outbreak of HPAI in 2004. This is significant because the traditional farming system included raising ducks in rice paddies and moving them long distances. Because clinical signs are rarely seen in these birds, there is a high risk of spreading the disease if they contact other waterfowl.

2.2.1.3. Transmission of Avian Influenza Virus

The three main pathways that birds shed AI to other animals or the environment are through feces, saliva and nasal secretions. Although feces normally contains large amounts of virus, recent studies have found higher quantities of HPAI in respiratory secretions (Aviaire 2010). The epidemiology of AI in land birds has shown that the fecal/oral route is the primary avenue of transmission. In farm poultry flocks infected with HPAI, respiratory transmission is a common route for spreading the disease. HPAI can be transmitted several ways, such as by live birds (migratory birds, infected poultry, and pet birds) and fomites. In addition, flies may act as a mechanical vector and cracked eggs from infected hens could transmit HPAI to other eggs (Aviaire 2010). In Thailand, poultry cases are also significantly associated with rice paddies and the presence of free-grazing ducks in the area. Another possible route for the spread of H5N1 worldwide is illegal trade and movement of infected poultry and exotic birds across national borders.

Transmission of AI to mammals can occur when infected birds excrete the virus in feces, saliva, nasal secretions and blood. Some mammals such as pigs shed the virus only from the

respiratory tract (Aviaire 2010). Pathways of AI transmission to mammals can be via direct or indirect contact. For example, mammalian cases of HPAI have occurred after ingestion of infected poultry and also by indirect exposure in a virus-contaminated environment.

In 2003 Yee et al. (2009) concluded that direct contact can spread H5N1 from infected poultry to humans. To date, direct contact with infected birds or an AI-contaminated environment and genetic re-assortment in an intermediate host, such as a pig, are the two main possible transmission pathways of AI to humans (Maton 2006). However, transplacental transmission may also be a pathway in some species, because virus antigen and nucleic material were detected in the fetuses of infected pregnant women (Aviaire 2010). At present, rarely has mammal-to-mammal or human-to-human transmission been reported (Aviaire 2010).

2.2.1.4. Survival of Influenza in the Environment

Temperature, pH and salinity are conditions that influence the survival of AI in the environment. AI can persist in low temperatures and in fresh or brackish water longer than in high temperatures or salt water. The virus may remain infective up to four days at 22^0C, and more than 30 days at 0^0C in lake water (Webster et al. 1978). Some studies showed that HPAI viruses persist in water for shorter periods than LPAI viruses. H5 and H7 HPAI viruses can survive at least 100 days in fresh water at 17 ^{0}C, and about 30 days at 28 ^{0}C, while LPAI viruses can persist in distilled water for 100 days at 28^0C and 200 days at 17^0C (Aviaire 2010).

A study by Shahid et al. (2009) showed that H5N1 virus can remain more than 100 days at 4^0C but lost infectivity after 30 minutes at 56^0C and after one day at 28^0C. H5N1 virus retained infectivity at pH 5 within 18 hours, and more than 24 hours at pH 7 and 9, while at high acidic pH (1, 3) and at basic pH (11, 13) H5N1 virus was virucidal after six hours of contact

time. Another study found a link between the use of probably contaminated water from wild aquatic birds in a nearby lake and the emergence of an H7N3 outbreak in a broiler farm in Saskatchewan, Canada in 2007 (Berhane et al. 2009).

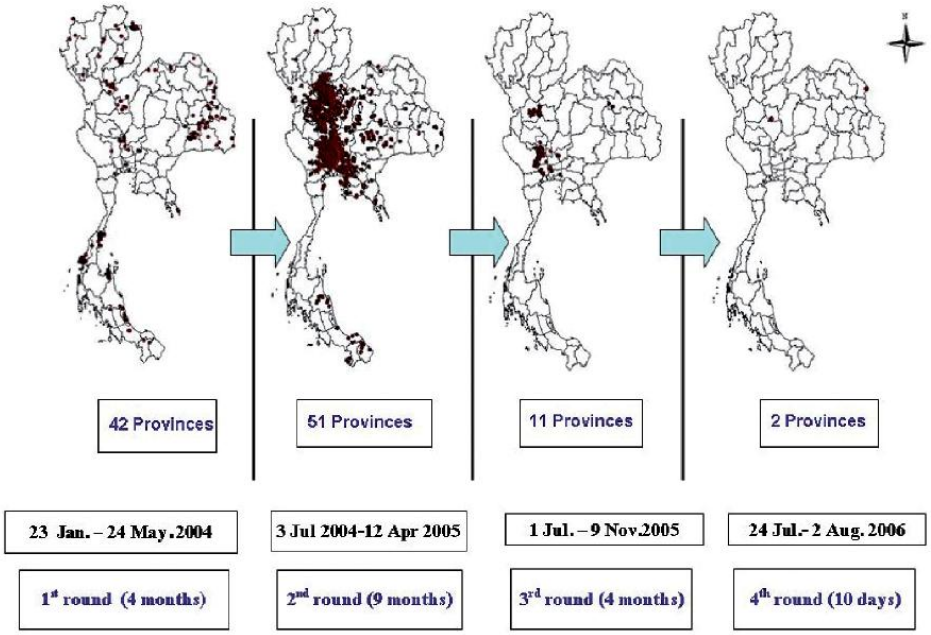
The persistence of LPAI viruses in feces is shorter than in water. They can survive in feces from 44 to 105 days (Aviaire 2010). Avian influenza virus can be infective in feces for 7 days at 20^0C and over 30 days at 4^0C (Webster et al. 1978). A study by Animal Health Australia (PLAN 2007) concluded that avian influenza will survive longer in feces in high moisture and low temperature conditions. A study by Bean et al. (1982) showed no influenza virus after 12 hours on paper and cloth tissue at 35-40% humidity, while influenza virus could be detected after 48 hours on stainless steel and plastic objects. In addition, influenza virus can survive several weeks on dust, cotton sheets and glass slides at 22^0C (Sobsey and Meschke 2003). An experiment in Thailand by Songserm et al. (2006) showed that AI persisted in one ml of fresh feces at 33-35^0C for up to 30 minutes, at 25-33^0C for up to three days, and it also lived for three days in water in a rice paddy that had raised HPAI-infected free-range ducks.

The resistance to high temperature and low pH of avian influenza virus is greater than that of mammalian influenza virus (Aviaire 2010). In addition, virus load and mode of transmission are important factors for its survival in the environment (Yassine et al. 2010). AI can be inactivated by heating to 56^0C for at least 60 minutes, a low pH (pH 2) environment, or exposure to ionized radiation or a variety of disinfectants, such as sodium hypochlorite, quaternary ammonium compound, and aldehyde.

2.2.2 HPAI Situation in Thailand

Although the first outbreak of HPAI in Thailand occurred in 2004, a large number of farmed poultry have died in several regions of Thailand since December 2003 (Auewarakul 2008). The HPAI outbreak in Thailand was categorized into four major waves by DLD (see Figure 3). There was also a small outbreak of HPAI in early 2007 (NaRanong 2008).

The first confirmed human and poultry cases of HPAI were reported on 23 January 2004 (FAO 2007). The first outbreak occurred at a layer farm in Suphanburi Province, located in the central part of the country, followed by scattered outbreaks which extended into the eastern part of Thailand (Gilbert et al. 2006, Kasemsuwan et al. 2008). The first human case of HPAI was a boy who lived in Kanchanaburi Province, located in the center region of Thailand and about 100 km west of Bangkok (Auewarakul 2008). At that time, genotype Z of HPAI virus was identified in suspected patients and animals and was closely related to virus from Vietnam (Puthavathana et al. 2005, Viseshakul et al. 2004). The second wave had the greatest impact on the poultry population in Thailand because 63 million birds in 51 provinces were culled. A total of 12 human cases were confirmed during the first wave (Maton 2006). To date there have been a total of 25 confirmed cases of human H5N1 in Thailand, 17 of which were fatal (FAO 2011). The last outbreak of HPAI in poultry was reported on 17 November 2008 (FAO 2011), although the last human case was reported on 27 September 2006 (WHO 2012).



Source: Department of Livestock Development.

Figure 3. HPAI outbreaks in Thailand 2004 to 2006.

2.2.3 Control and Prevention Strategies for HPAI in Thailand

Stamping Out and Movement Control

In January 2004, flocks infected with HPAI, as well as their products, feed, bedding, waste and manure were destroyed immediately. In addition, law enforcement applied preemptive culling within a 5 km radius around the outbreak farm and restricted movement of other poultry and their products within a 50 km radius. Since February 2004, disease control measures were adapted by the Thai animal health authorities to fit the situation. For example, during 11-29 February 2004, the radius of the pre-emptive culling area was reduced to 1 km from infected premises and followed by disinfection, because much fewer cases were detected and negative public perception remained after the massive culling of poultry in January 2004 (Tiensin et al.

2005). After July 2004, only affected HPAI cases, their products and other potentially contaminated materials were destroyed immediately. Neighboring flocks within a 5 km radius zone were quarantined and were culled upon a confirmed HPAI laboratory result. The radius for movement restrictions of poultry and their products were reduced to 1-5 km from the infected area (Tiensin et al. 2005).

Surveillance and Monitoring

Initially, a nationwide active clinical surveillance program was conducted by DLD in mid-January 2004 to detect possible cases of HPAI in poultry using the existing AI case definition. An AI case definition was established based on field information and scientific findings observed in the Thai outbreak, because some of the clinical signs differed from those reported in other countries (DLD 2006). This was followed by implementation of several nationwide comprehensive surveillances (X-ray survey), one in 2004, three in 2005, and three in 2006.

Under the surveillance system, cloacal swabs were randomly collected from four flocks per village (five birds per flock) and sent in pulled tubes (five swabs per tube) to the National Institute of Animal Health (NIAH) or a regional laboratory for diagnosis. Only HPAI-free birds were granted permission to move to the slaughter house or other areas, despite the fact that the laboratory process took about eight days to get a result. Replacement of new broiler poultry flocks in the affected area was allowed after 60 days, and after 90 days in layer and backyard farms once disinfection was completed (Tiensin et al. 2005).

Other Supportive Measures

Several HPAI disease control measures were applied, including biosecurity enhancement, restructuring of the farming system especially with regard to free-grazing ducks, registration of

fighting cock arenas, and compartmentalization with the commercial poultry system and surveillance system (Eagles et al. 2009, Kasemsuwan et al. 2008, Prakarnkamanant et al. 2010). Some activities were prohibited, such as poultry exhibition, cock-fighting and free-grazing ducks. Violation of this regulation resulted in a fine.

Furthermore, a public awareness campaign was conducted to educate people about AI and encourage relevant people to be aware of HPAI and concerned about biosecurity in their workplace or facility. Other species such as wild birds, swine, dogs and cats were included in surveillance by NIAH in an attempt to avoid possible contamination or genetic re-assortment.

Effectiveness of Control Measures

Although total depopulation of poultry in large areas is a highly restrictive control measure for HPAI outbreaks in some countries, it was not a practical option when the HPAI outbreak in Thailand was scattered throughout all regions. A combination of depopulation, early detection and responsible practices was more appropriate for the circumstance in that country (Tiensin et al. 2005). As most of the HPAI cases occurred in backyard farms, surveillance at the village level was obviously needed. Community-based surveillance was instituted in Thailand through the government sector surveillance network. The Ministry of Agriculture and Cooperatives, Ministry of Public health (MOPH), provincial governors, volunteer public health MOPH workers and DLD livestock workers collaborated together in the surveillance system. More than 100,000 public health and veterinary volunteers were involved in the network at the village level. Education regarding early detection and biosecurity enhancement given to the people directly involved may be the most critical factor in the effort to eliminate HPAI, while the changing of traditional farm practices needs more time (Tiensin et al. 2005). The village level of surveillance has been an important part of the successful prevention and control of HPAI in

Thailand (WHO SEARO 2007). This success shows that community-based programs should be encouraged to improve community participation in disease surveillance and can enhance the effectiveness of any prevention and control program. Furthermore, collaboration between stakeholders is key to eliminating the disease in the long term.

2.3 Community-based approach (CBA)

A community-based approach (CBA) is a way of accomplishing community goals through their own members. The participation of community members in the design and implementation of a project that takes place in their community is the principle of community-based methods. This concept has proven success because the most appropriate solutions for problems that arise in communities are frequently best addressed by persons directly affected and who have intimate knowledge of the decisions. A CBA is a cost effective and efficient disease control method over the long term (WHO 2002).

There are two main parts to a CBA, situation analysis and community mobilization for empowerment. Situation analysis includes several parts: information analysis, stakeholder analysis, establishing contact with the community, participatory assessment and participatory planning. The United Nations High Commissioner for Refugees (UNHCR) (2008) explained that information analysis is the phase in which known information from existing documents and data about the relevant problem are analyzed. This phase helps to bring the scope into specific focus and prepares for the participatory assessment phase. This participatory assessment phase is used to identify people who can be influenced or may be affected in the operation. This is also the time for key stakeholder analysis, finding the key person who has a stake in solving the

particular community problem. These phases then support planning activities within the community.

A key component of CBA is community mobilization for empowerment because this process helps communities strengthen their capacity to develop and implement action plans, and to self-monitor and evaluate the results of their work. However, because of time limitations for this study, situation analysis was the focus more than community mobilization for empowerment. Knowledge, Attitude and Practice theory (KAP) were applied to the situation analysis, particularly to the information analysis phase. The KAP survey data from this study were essential to help create a plan and to implement and evaluate particular topics regarding avian influenza. The data will also be important for future study.

2.3.1 Previous Community-Based Approaches (CBA) in Thailand

To prevent and control public health diseases, community participation is emphasized as a cost effective and efficient method of disease control over the long term (WHO 2002). In Thailand in 2005, a CBA was applied for prevention and control of Dengue Hemorrhagic Fever in Kanchanaburi Province (Therawiwat et al. 2005). The study was quite successful because the experimental group was significantly higher in all categories of knowledge, perception, self-efficacy and larval survey practices before the experiment than the comparison group. In 2008, one study applied a CBA to a tuberculosis control program in the urban slum Klong Toei community in Bangkok (Chusri 2008). Several interesting outcomes were found by this study, providing important information for planning and implementing strategies in the future. In addition, in 2006 Thailand developed a community-based program to prevent AI in the Province of Suphanburi where many outbreaks of this disease had occurred (Maton 2006). This program

was quite successful because KAP levels of participants were significantly higher than they were before implementation.

2.3.2 Knowledge, Attitude and Practice theory (KAP)

Knowledge

According to Bloom's definition, knowledge is both specific and general recognition of several processes including experience by personal memory (Bloom 1956). From Bloom's study, knowledge can be classified in six levels: (1) knowledge or recall, (2) comprehension or understanding, (3) evaluation, (4) analysis, (5) synthesis and, (6) application by complex cognition level. Bloom also described that there were three levels of knowledge measurement including: (1) the ability of recall, (2) ability of interpretation and comprehension, (3) ability of adaptation, analysis, synthesis, conclusion and evaluation.

Recall and understanding, which are level 1 and level 2 of knowledge, were referred to in this study. The ability to recall and understand facts about AI, including signs and symptoms in both poultry and humans as related to prevention and control, were measured by an interview questionnaire. The questions were created for true-false testing in a simple, suitable and convenient way.

Attitude

Longman (2003) defined attitude as peoples' opinion and feeling about a particular thing, idea or person. Newstrom and Davis (1986) explained that work and administrative structure were affected by attitude toward work because attitude can be changed by the environment.

attitude was classified into three components: (1) affective, (2) cognitive and (3) behavior (Oskamp and Schultz 2005, Triandis 1971).

Environment and experience influence attitude. For example, attitude can be changed by several factors, such as an individual component, communication with others, and specific experiences (Oskamp and Schultz 2005). Attitude is challenging to measure because it involves subjective or private feelings. A rating scale can be applied to evaluate attitude, such as the Likert scale, Guttman scale and Thurston-type scale. The Likert scale was used in this study because it is a direct estimate technique that is easy to design with a high level of reliability and is also easy for the subjects to understand (Streiner and Norman 2008).

According to the Likert method, the rating scale for this study was divided into three choices: agree, not sure and disagree. These were used for measuring the attitude toward AI control policies, compensation for destroying infected/suspected poultry, and the surveillance system in place since the 2004 HPAI outbreak in Thailand. The questions were adapted appropriately for each actor in the poultry supply chain.

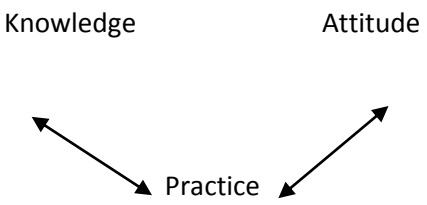
Practice

Longman (2003) defines practice as the regular activity that people do in order to improve a skill or ability. Knowledge, attitude or beliefs are affected by practice (Kothandapani 1971). In this case the rating scale followed the Likert concept: all of the time, sometimes, and no. These choices evaluated the practice related to prevention and control of avian influenza virus among each actor in the poultry supply chain. However, an observation checklist (yes/no) was also used to evaluate the practices of poultry farmers because of field study limitations for other actors. For example, because a characteristic of a trader's job is to always move from place to place, it is not convenient to follow them and observe their normal work operation.

2.3.3 The relation between Knowledge, Attitude and Practice

Manoonpeju (1988) concluded that there are four types of relationships between knowledge, attitude and practice.

1. Knowledge affect to attitude, and attitude affect to practice
2. Knowledge related to attitude, both of them share affect to practice
3. Knowledge affect to practice, attitude affect to practice, but knowledge is not related to Attitude
4. Knowledge affect to attitude and indirectly affect to practice by stimulating attitude (KAP model) as exhibited in the following diagram:



Schwartz (1975) suggested that knowledge, attitude and practice are all correlated and have relationships with each other. For example, in this study, if a participant had correct knowledge about AI involving prevention and control, a positive attitude toward prevention and control policy would be enhanced by their knowledge. Attitude would then inspire proper action to prevent and control avian influenza virus.

2.3.4 KAP survey

A KAP survey was used in the study to collect data for each actor in the poultry supply chain. KAP survey data were essential to help create a plan and to implement and evaluate

particular topics regarding avian influenza in the study. Knowledge gaps or behavioral patterns received from the KAP survey helped facilitate understanding or action. A constructed, standardized questionnaire was used to collect data by an interviewing method. There are a total of six steps to the KAP survey (WHO 2008), beginning by defining the survey objective, developing the survey protocol, designing the survey questionnaire, implementing the KAP survey, analyzing the data, and lastly use of the data. A KAP questionnaire was prepared in three steps: domain identification, question preparation, and validation of questions (Kaliyaperumal 2004).

2.3.5 Previous KAP study

When used within a narrow focus and limited scope, KAP studies have been widely used in public health studies around the world for at least forty years. For example, a KAP study was conducted among Nigeria women regarding breast cancer in 2005 (Okobia et al. 2006). The results suggested that all women in Nigeria should be encouraged to have adequate and well-distributed information about breast cancer. In the same year, another KAP study was done of elderly Iranians regarding their general health, provision of long-term health care, and proper treatment methods (Kaldi 2005). In Thailand, there were two studies that applied KAP methods concerned with pesticides. One was utilization among agriculturists in Sukhothai Province (Jariya and Kuruchittham 2007). The other the use of personal protective equipment among chili-growing farmers in Ubonrachathani Province (Norkaew 2009).

Several KAP studies were conducted related to AI in affected countries such as China, Laos, Vietnam, Cambodia, Indonesia and Thailand. For instance, a KAP study was conducted by Xiang et al. (2010) regarding avian influenza in urban and rural areas of China. After that, the

KAP method was used in a study of Pandemic Influenza (H1N1) in 2009 among the Chinese general population (Lin et al. 2011). In Laos, KAP was recently used by Indochina Research (Laos) Limited regarding AI among backyard poultry farmers. Likewise, a baseline KAP study was conducted for reducing the risk of AI among villagers in Vietnam, and in another study it was used to compare results between the countries of Cambodia, Vietnam and Laos (Englehardt and Lindgren 2008).

A study by Prapasiri et al. (2004) did a KAP survey of people in a community in the Nakhon Phanom Province regarding avian influenza. They wanted to compare KAP of people before the HPAI outbreak had occurred and after application of several intervention strategies. The outcome of the study showed that both knowledge and attitude after the outbreak were statistically different from before the outbreak, while behavior had not changed significantly. However, 31.6% of respondents had changed their behavior regarding contact with poultry or poultry products.

2.4 Relevant study

In 2009 a study was conducted in Nigeria by Akinwumi et al. (2009) where the poultry value chain was observed, and an analysis was made of its linkages and interactions with HPAI risk factors. They studied all four types of poultry production systems corresponding roughly to the FAO poultry sector classification: backyard indigenous growers, backyard commercial farmers, medium to large scale commercial farmers, and industrial farms. The study found that breeder and hatchery distributors were potentially dangerous actors who could spread HPAI because of their linkage to the DOC supply chain. In addition, toll millers were likely to spread HPAI from re-using bags. If the feed has been contaminated via the actions of the toll millers,

the disease can spread among farms. The backyard indigenous grower had the highest risk of HPAIV infection from a free-ranging system with minimal biosecurity. Although backyard commercial farms had a higher biosecurity level than backyard indigenous growers, they could contract HPAI by using contaminated feed from the toll millers. Because of a higher level of biosecurity and hygiene, medium to large scale commercial farms and industrial farms had less risk of spreading HPAI. Moreover, the researcher team revealed that live bird collectors and distributors were potentially important actors for spreading HPAI. For example, they mixed poultry species in cages and transported humans and poultry in the same vehicle.

2.5 Study area of Nakhon Phanom Province

2.5.1 Geographic information

Nakhon Phanom Province is located in northeast Thailand approximately 740 kilometers from the capital city of Bangkok (Figure 4). The northeast side of the province borders Khammouan and the Tha Khaek district in Laos PDR across the Mekong River. The border can be crossed by boat and also via the Thai-Laos friendship bridge. A boat runs a river-crossing service every 30 minutes for most of the day, particularly along the four border districts. The Thai-Laos friendship bridge was opened for traffic on November 11, 2011. It is an important pathway for trade between Thailand, Laos, Vietnam and Myanmar.

Nakhon Phanom Province is divided into 12 districts. Four districts are along the border between Thailand and Lao PDR including Nakhon Phanom Mueang District (number 1), Tha Uthen District (number 3), Ban Pheang District (number 4) and That Phanom District (number 5). As shown in Figure 4, these four districts connect with the Khammouane Province of Laos PDR across the Mekong River.

Nakhon Phanom Mueang District is located in the easternmost part of Nakhon Phanom Province. This district is further subdivided into 15 Tambons. Tambon Ban Klang, the study site, is located about 26 kilometers south of the center of Nakhon Phanom Mueang District. There are 13 villages in Tambon Ban Klang.

Figure 4. Map of Nakhon Phanom Province and its districts.

2.5.2 Population

From the 2000 National Statistic Office Population and Housing Census, Nakhon Phanom Province had a total population of 157,438 within 851.01 square kilometers, a population density of 185 people per square kilometer. Fourteen percent of the population in Nakhon Phanom Province lives in municipal areas. The proportion between male and female population is nearly equal. The age range of 15-59 years old is the biggest group within the population of Nakhon Phanom. Almost 100 percent of the city population is of Thai nationality, and 0.2 percent of them can speak either Laos or Vietnamese. Interestingly, nearly 50 percent of people in the range of 6-24 years old do not attend school. The majority of people in Nakhon Phanom Province work in the agriculture sector (82.2%) and 51.5 percent are unpaid family

workers. The study site, Ban Klang Sub-district (Tambon) in the Nakhon Phanom Meaung District, had a total population of 8,662 representing 3,327 males, 4,325 females and 1,729 households in 2010.

2.5.3 Poultry production

According to DLD, in 2010 the province raised a total of 1,203,277 poultry (1,104,045 chickens, and 99,232 ducks). Over eighty-two percent of the chickens were indigenous chickens, approximately 15 percent were layers and the rest were broilers, breeding broilers and breeding layers. Nearly 42,000 farmers were raising chickens of some type; the majority of them raised indigenous chickens (99%) while there were only 279 farmers raising layers. From a previous study by Heft-Neal et al. (2008), it is presumed that 94 percent of native chicken farmers were backyard or small-holders, each raising fewer than 500 chickens.

In contrast, animal population surveys at the district level by DLD in 2010 showed that approximately 97 percent of layer populations were raised by 41 farmers in Tambon Ban Klang, Nakhon Phanom Meaung Subdistrict. Therefore, the average layer population per farm was about 3,700 birds raised under commercial poultry production systems with less biosecurity than an industrial poultry system. The layer population in Tambon Ban Klang is, therefore, a good representative of layers in the entire province under conditions of farm sector 3.

2.5.4 Cross-border trade at immigration checkpoint

There are four immigration check points in Nakhon Phanom Province. They are located in four districts that are along the border between Thailand and Lao PDR including Nakhon Phanom Mueang District, Tha Uthen District, Ban Pheang District and That Phanom District. At

these points the Lao people are allowed to enter Thailand to sell or buy commodities during the day, but Thai people are not allowed to cross the river to Lao. Many Thai, as well as Lao market vendors, come to sell their products in the market at the immigration checkpoint. Several consumer products are in the market, such as clothes, fish, meat and eggs. However, the sale of illegal products, such as wildlife, is prohibited. Both Thai and Lao people buy products from this market. Therefore, markets at the immigration checkpoints are a channel of cross-border trade between Thailand and Lao.

2.5.5 Background of Ban Klang layer raiser system

Layer farmers in Ban Klang replace their poultry flock using one-day-old chicks (DOC) because they want the chickens to be familiar with all the chickens in the layer house. The farmers buy the replacement chicks from an industrial poultry farm such as LaemTong Co. The chickens are raised in a cage-free system of layer houses most commonly constructed of bamboo and wood. The floor of a chicken house is approximately 1-1.5 meters above the ground and sloped for easier collecting of eggs from the outside (Figure 5). Grated bamboo flooring allows most of the chicken feces to fall to the ground. This arrangement decreases the ammonia effect to the respiratory system of the chickens.

Figure 5. Outside and inside of a layer house in Tambon Ban Klang.

Chickens are fed twice a day in the morning and evening and have an unlimited water supply. Every farm has its own animal feed mixer. A cooperative animal feed stock for farmers who are members is located in Tambon Ban Klang. It was established to help farmers avoid being taken advantage of by middlemen. By buying a large quantity of feed, this aggregation of farmers has increased negotiating power for the price of animal feed and have direct access to the main feed supply without a middleman. However, farmers must transport their own feed from the cooperative stock. The cooperative has basic feed ingredients, such as corn, fish meal, and soybean meal, but if the farmer needs rice bran he must purchase that from a local supplier.

An outbreak of HPAI occurred in Tambon Ban Klang in July 2006. At that time the entire layer population in the area was destroyed, as were other products such as eggs and poultry feed. In addition, six humans were suspected of being infected with the AI virus (MOPH 2006). Help from several organizations, including seminars on how to adjust farming practices and improve biosecurity, as well as financial support from banks, enabled layer farmers to resume production in 2007. Before farmers started to raise layers again, their farms needed to pass the DLD's minimal requirements for biosecurity standards. For example, farms had to have a clearly marked farm area, only one entrance for disinfectant equipment to enter the premises, the living area had to be separate from the farm area, and the chicken house had to be covered by a net to prevent contact with waterfowl. These enhanced biosecurity and hygiene measures were incorporated into the farms while preserving the local culture and wisdom for raising layers in this Tambom.

CHAPTER III

METHODOLOGY

To accomplish the stated objectives of this study, two consecutive phases of a cross-sectional design were followed. Phase 1 was divided into two parts: Part 1 was the market chain analysis which aimed to determine the links between the various paths of sources, poultry marketing, and poultry products. The second part of phase 1 was the risk assessment of both risk pathways along the market chain and the risk behaviors of each actor. Collected data from phase 1 were used for phase 2. Phase 2, focus discussion group, was a community-based approach that was applied for collecting in-depth information from actors who had the highest risk of transmission of AI along the poultry market chain.

3.1 Phase 1: The poultry market chain analysis and the risk assessment along the chain.

3.1.1 Research Design

The cross-sectional study using series of constructed, interview questionnaires was employed. Interviewees included groups of producers (layer farmers), middlemen (aggregators, market vendors), processors, and consumers. Each group of the interviewees was questioned using a set of questionnaires designed specifically for them.

3.1.2 Study Site

This study was conducted in Tambon Ban Klang, Nakhon Phanom Meuang District, Nakhon Phanom Province, which is located in Northeastern Thailand. Nakhon Phanom Province is 740 kilometers far from Bangkok. Tambon Ban Klang is one of fifteen subdistricts in the

Nakhon Phanom Meaung District. In 2011, Tambon Ban Klang had a total population of 8,570 (4,308 males, 4,262 females) and a total of 2,032 households (DOPA 2011). This Tambon was selected as the study site because it accounts for nearly 97 percent of the layer population of Nakhon Phanom Meaung District, and 94 percent of the layer population in the entire province (DLD 2010). In addition, Tambon Ban Klang experienced an outbreak of AI in July 2006 that greatly affected the socio-economic status of the community.

3.1.3 Study Population

The study population are actors who are related to the Ban Klang layer market chain, including layer farmers (producers), aggregators, market vendors, processors, and consumers. Participants were selected using the following two criteria: (1) the respondent was between 18-60 years old and not pregnant or disabled; and (2) the respondent had a willingness to join the study and provided informed consent with a verbal agreement.

3.1.4 Sampling scheme and Sample size

There are 49 layer farms in Tambon Ban Klang. All layer farms were included in this study; hence, no sampling was done at the producer level. The other actors in the poultry market chain were selected by convenient sampling method using snowballing technique (Coryn et al. 2007, Hanneman and Riddle 2005, Heckathorn 2002). The actors in the poultry market chain were identified by the layer farmers, for which their names and contact details were retrieved.

3.1.5 Research Instruments and Measurements (Appendix 1)

The research instruments for phase 1 were three sets of constructed questionnaires, including questionnaires on market pathway, assessment of risk along the market pathway, and assessment of risk behaviors. The questionnaires considered three main products, including live chicken, eggs and manure. Each group of the interviewees, including producers (layer farmers), middlemen (aggregators and market vendors), processors, and consumer, were questioned using a set of questionnaires designed specifically for them. Questions being asked could be described in three main components, including interview questions to identify market pathways and risk along the market pathways, interviewers' observation for risk behaviors at the producer level, and interview questions on knowledge, attitude and practices (KAP) regarding prevention and control of AI.

Interview questions to identify market pathways and risk along the market pathways consisted of questions on sources of poultry products, means of transportation, types of poultry products (live chickens, processed chickens, eggs, and disposal of layer manure), reasons for engaging in trades with particular sources, and experience with AI. Questions for assessing risk pathways were different among the types of actors regarding their activities. For example, farmers were asked, as producers, where they had sold their poultry products, while consumers were questioned, as end actors in poultry market chain, where they had bought poultry products. It was also of interest to know how farmers managed sick or dead chicken on their farms, and also how aggregators/market vendors handled abnormal poultry products. Demographic data, including gender, age and educational levels were retrieved from a survey collected by Nakhon Phanom University in the same population. Component 1 of questionnaires included both open-ended and direct-answer types of questions.

Once at a farm, an interviewer made observation on farmer practices and farm biosecurity. The observation included whether other animals such as dogs or cats were present within the farm area, appropriate disinfection equipments and/or facilities for vehicles, humans and containers were available and were in good conditions, direct contacts between layer chicken and wildbirds or any vector capable of transmitting HPAI virus weer possible, proper management of waste materials and sick/dead poultry were in place, and measures to prevent possible risk of animal-to-human transmission of HPAI virus were practiced. There were three choices of observation: yes, no and not sure. This component was only applicable for the questionnaire at producer level.

A set of questions on the questionnaires was designed to assess risk behaviors of each actor. Specifically, the questions aimed to assess levels of knowledge and attitude, and associated practices (KAP) of each of the respondents regarding prevention and control of AI along the poultry market chain. This component of the questions required respondents to provide answers to closed-end type of questions. Responses from the participants were given scores as low, moderate and high for knowledge and practice; while negative, neutral and positive were used for attitude.

The Structure of the Knowledge Component to Questionnaires Relevant to AI

The questions regarding knowledge on AI were the same for all actors in the poultry market chain. Questions inquired whether participants know about animals and human population that are at risk of the disease, main clinical signs in human and poultry, mode of transmission of AI among poultry and between poultry and humans, important of HPAIV in community, relation of HPAI with actors along the poultry supply chain. There were thirteen

questions. Five of the thirteen questions allowed for more than one answer. A correct answer received one point, while an incorrect answer received no points. The total scores of each of the respondents were grouped by applying Bloom's method (Bloom 1971). The knowledge level regarding AI was categorized into three levels using the following criteria:

Score 0-16 (less than 60%)	Low knowledge level
Score 17-21 (60-80%)	Moderate knowledge level
Score 22-27 (81-100%)	High knowledge level

The Structure of the Attitude Component to Questionnaires Relevant to AI

The questions to assess participants' attitudes toward AI and its control measures were different for each type of the actors. There were 22, 24, 19 and 22 questions for producers, middlemen (aggregators and market vendors), consumers, and processors, respectively. The Likert Scale (Jacoby and Matell 1971) was applied to score the answers, with 3 points possible for each question. There were both positive and negative statements in the attitude questions; and respondents were asked whether they would agree. Therefore, the scale for the answers was opposite between positive and negative statements. The scoring for each scale was as follows:

For positive statements:	Agree or satisfied	3	points
	Not sure	2	points
	Do not agree or unsatisfied	1	point
For negative statements:	Agree or satisfied	1	point
	Not sure	2	points
	Do not agree or unsatisfied	3	points

The total score from the respondents were grouped to describe attitude levels by applying Bloom's method (Bloom 1971). The attitude regarding AI for each actor was categorized into three levels using the following criteria:

Table 1. Tubulation of score range for categorizing attitude levels regarding AI by actors

Actor	Negative attitude (less than 60%)	Neutral attitude (60-80%)	Positive attitude (81-100%)
Farmer	Score 0-39	Score 40-53	Score 54-66
Middleman (aggregator/market vendor)	Score 0-43	Score 44-57	Score 58-72
Consumer	Score 0-33	Score 34-46	Score 47-57
Processor	Score 0-39	Score 40-53	Score 54-66

The Structure of the Practice Component Regarding Prevention and Control of AI

Questions regarding practices were different for each type of the actors and depended on applicable activities. There were 13, 7, 6 and 12 questions for producers, middlemen (aggregators and market vendors), consumers and processors, respectively. The Likert Scale (Jacoby and Matell 1971) was applied to score answers. There were both positive and negative statements in the questions. Respondents were requested to state whether a question was true in their opinion. The scoring for each scale was given as follows:

For positive statements:	At all times	3	points
	Sometimes	2	points
	No	1	point
For negative statements:	At all times	1	point
	Sometimes	2	points
	No	3	points

The total score of individual respondents were classified into the following three levels of practices, including low, moderate, and high practice level using Bloom's method (Bloom 1971).

Table 2. Tubulation of score range for categorizing practice levels regarding prevention and control of AI by actors

Actor	Low practice level (less than 60%)	Moderate practice level (60-80%)	High practice level (80-100%)
Farmer	Score 0-22	Score 23-31	Score 32-39
Middleman (aggregator/ market vendor)	Score 0-12	Score 13-16	Score 17-21
Consumer	Score 0-10	Score 11-14	Score 15-18
Processor	Score 0-21	Score 22-29	Score 30-36

From the results of phase 1, actors with the highest risk of introduction and transmission of AI along the poultry market chain were identified. These actors were of high interest for this study, and more information about these individual actors was sought. Therefore, a community-based approach, using a focus discussion group, was employed in phase 2 to collect in-depth information on the market pathway, risk pathways, and KAP. In addition, key stakeholders who were identified during the pre-implementation process will be invited to participate in phase 2 of the study.

3.1.6 Pre-Implementation Phase

The first draft of the questionnaire was pre-tested on five farmers, three aggregators, five market vendors and ten consumers from the Ban Klang layer market chain. The questionnaires were then revised according to the feedback from the pre-test.

3.1.7 Data Collection

Before the interview, the researcher explained the purpose of the study and received informed verbal consent from all respondents (Appendix 2). The researcher collected data with helps from key stakeholders of the Tambon Ban Klang. These stakeholders helped the researcher to invite farmers to participate in the study and to translate some of the questions into local language when needed. From these data, the researcher was able to connect with other actors in the market pathway. For example, the researcher was able to get information about middlemen, their locations and contact details, and types of poultry products and farmers who sold such products to them. The researcher interviewed the middleman group when they visited a farm or by appointment. In addition, the researcher was able to know locations of markets where poultry products were sold by the middleman, and then was able to collect data from participating market vendors and consumers via face-to-face interviews.

3.1.8. Data Analysis

Statistical Data Analysis:

Descriptive statistics, including frequency and percent distribution, were used to analyze demographic information, market trade pathways and risk pathways. In addition, mean, median, standard deviation, minimum and maximum were used as descriptive statistic for the knowledge, attitude, and practice (KAP) regarding AI, which were applied for risk behavior assessment.

Inferential statistics, including Sperman's rank correlation coefficient (Corder and Foreman 2009), were used to estimate the quantitative relationships between knowledge, attitude and practice (KAP) regarding AI, also. The Kruskal-Wallis and Mann-Whitney test were used to determine the statistical associations between demographic information and KAP toward AI, and

KAP regarding AI among each actor. The data from questionnaires were encoded and analyzed by each actor along the poultry supply chain via the Minitab 14 (Student version, 2007) and Excel (Microsoft Office, 2007) programs.

3.2 Phase 2: Focus Discussion Group (FDG)

3.2.1 Action Research Procedure

Data collected from phase 1 were used in phase 2. The aim of this phase was to understand the risk pathways , and the type of actors involved with the activities along these poultry marketchain. Therefore, a focus discussion group was applied to get in-depth information. The convenience sampling method was used for sampling participants from actors who had a highest risk of introduction and transmission AI along these chain as the results of phase 1 to participate in the focus discussion activity. In addition, key stakeholders, including a chairman of Ban Klang poultry feed group, a Nakhon Phanom Province veterinary officer, and a leader of a local village were invited to participate in this discussion activity. The date, time and place of a group discussion were chosen by the convenience of all participants.

For the purpose of this study, a community refers to the general public where community participation occurs, excluding government officials working on the AI surveillance system. Therefore, the leader of Tambon Ban Klang was invited to be a representative of the community. The facilitator or mediator refers to the individual who coordinated and aided the community and the government in the process of promoting community participation, as well as a chairman of Ban Klang poultry feed group. According to the Ban Klang layer market chain, a chairman of the Ban Klang poultry feed group is a key person who coordinates and promotes participation between the producers and Nakhon Phanom livestock officers; he is representative of a facilitator

in this study. The government refers to the Nakhon Phanom livestock officers who are responsible for providing animal health services, including disease-control efforts along the layer market chain.

3.2.2 Research Instrument

Open-ended questions for the focus group were constructed following the results of phase 1 via three main topics: disease-related issue, control-related issues, and community participation-related issues. A researcher asked the questions (Appendix 3) to participants and gave time for the discussion of the group to reach a final answer. An audio recorder was used during group activities to record the conversation.

3.3 Protection of Human Subjects

The study was approved to involve human research subjects by the Institutional Review Board (IRB) for Colorado State University (Appendix 2). Before each interview, the researcher explained the purpose of the study to all population subjects. Subjects had the right to stop participating in the study at any time and were informed that stopping would not affect them in any way. They were assured that the information they gave to the study would be confidential and that any questions they had regarding the study would be answered promptly by the researcher. The researcher also read the informed consent information to subjects, and a local health officer helped translate to the local language when necessary. Only subjects who verbally agreed with the informed consent were included in this study.

CHAPTER IV

RESULTS

This chapter provides the findings obtained from the analysis of the survey. The findings are presented with respect to the study's objectives and are presented in each phase as follows:

4.1 Phase 1: The poultry market chain analysis and the risk assessment along the chain.

4.1.1 Demographic Information

This study was conducted in Ban Klang Subdistrict (Tambon), Nakhon Phanom Meaung District, Nakhon Phanom Province, Thailand. The study sample was comprised of 48 farmers, 19 aggregators, 33 market vendors, 99 consumers, and 4 processors. Each participant consented to complete the face-to-face structured questionnaires regarding the poultry market pathway and knowledge, attitude and practice (KAP) of AI. Participants' demographic characteristics are presented in Table 3. Respondents in the farmer group were 25 (52.1%) males and 23 (47.9%) females, with ages ranging from 18-60 years. Half of the farmers were between 46-60 years old. The highest educational level for the majority of these farmers was elementary (47.9%) and high school (47.9%), while only 4.2% finished diploma and none went to college.

Traders who only gather product and are wholesalers (aggregators) consisted of 13 (68.4%) males and 6 (31.6%) females. The majority of aggregators were in the range of 31-45 years old (57.9%) and 46-60 years old (36.8%), while only 5.3% were in the range of 18-30 years old. More than half of the aggregators (52.6%) had finished elementary school, and 5.2% had graduated with a bachelor's degree.

The majority of the market vendor group was female (84.8%). Approximately half were in the range of 46-60 years old (48.5%), while the other half were between 31-45 years old (39.4%) and 18-30 years old (12.1%). Elementary school was the highest educational level for approximately two-thirds of the market vendors (60.6%), but there were still 6.1% that had graduated with a bachelor's degree.

The consumers in this study were also predominately female (78.8%). The majority of them were either in the 46-60 year-old group (39.4%) or the 31-45 year-old group (38.4%). Approximately two-thirds of these consumers also had an elementary level education (60.6%), but 8.1% had completed a bachelor's degree. Lastly, three-fourths of the processors were females. Half of them were either in the 31-45 year-old group or the 46-60 year-old group. All of them had finished elementary school.

Table 3. Number (percentage) of producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain who participated in the study by demographic characteristics

		Actor				
Demographic Characteristics		Producers (n=48)	Aggregators (n=19)	Market vendors (n=33)	Consumers (n=99)	Processors (n=4)
Gender	Male	25(52.1)	13(68.4)	5(15.2)	21(21.2)	1(25.0)
	Female	23(47.9)	6(31.6)	28(84.8)	78(78.8)	3(75.0)
Age (years old)	16-30	8(16.7)	1(5.3)	4(12.1)	22(22.2)	0(0.0)
	31-45	16(33.3)	11(57.9)	13(39.4)	38(38.4)	2(50.0)
	46-60	24(50.0)	7(36.8)	16(48.5)	39(39.4)	2(50.0)
Education level	Elementary	23(47.9)	10(52.6)	20(60.6)	60(60.6)	4(100)
	High school	23(47.9)	4(21.1)	8(24.2)	28(28.3)	0(0.0)
	Diploma	2(4.2)	4(21.1)	3(9.1)	3(3.0)	0(0.0)
	Bachelor	0(0.0)	1(5.2)	2(6.1)	8(8.1)	0(0.0)
	Higher than bachelor	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.1.2 Market Chain Pathway

The researcher began collecting data from the farmers because registration data was provided by Nakhon Phanom Provincial Livestock Officers. Additionally, because farmers' living places were permanent, it was easier to link the poultry market chain from the origin than backward from the end. There was a total of 49 layer farms in the Tambon Ban Klang; one farm did not participate in the study. A designated farmer for each of the other 48 farms was represented in the survey. The snowballing method was used to find linkages, both upstream and downstream of the market chain.

Using trade information supplied by the farmers, the researcher set appointments and conducted interviews by telephone with the sellers of poultry products. Consequently, the researcher was able to roughly complete the link between farmers, aggregators, market vendors, consumers, and processors.

The study included the participation of 19 out of 21 aggregators (90%), 33 out of 58 market vendors (57%) and all 4 (100%) processors in the Tambon Ban Klang. In addition, the researcher surveyed consumers during their purchasing of Ban Klang poultry products either at the farm or the local market. No permanent Thai-Lao cross-border traders (aggregators/market vendors) were found in this system during the observations, but some of the traders came from outside the Tambon Ban Klang, from other subdistricts or districts.

Unfortunately, the researcher was unable to determine the sites for the disposal layer manure pathway due to the scarcity of information from farmers. This was mainly due to the fact that the majority of layer manure buyers are only temporary buyers who contact the farmers only when the layer manure is needed. Despite this setback, Figure 6 describes the layer market chain pathway of the Tambon Ban Klang.

All of one day old chicken (DOC) in the Ban Klang layer farms system were supplied by industrial poultry companies located in other provinces, such as Leamthong Co., Betrago, and United Co. The farmers maintained an informal contract with a sales representative from one of these industrial poultry companies. The farmers buy at least their layer starter feed from these companies. All of the farmers bought the ingredients (i.e., corn and broken rice) for adult layer feed from the Ban Klang feed mill and then mixed these ingredients using their own mixer at the farm. In addition, 9 of 48 farms (18.8%) also buy animal feed from local private feed suppliers.

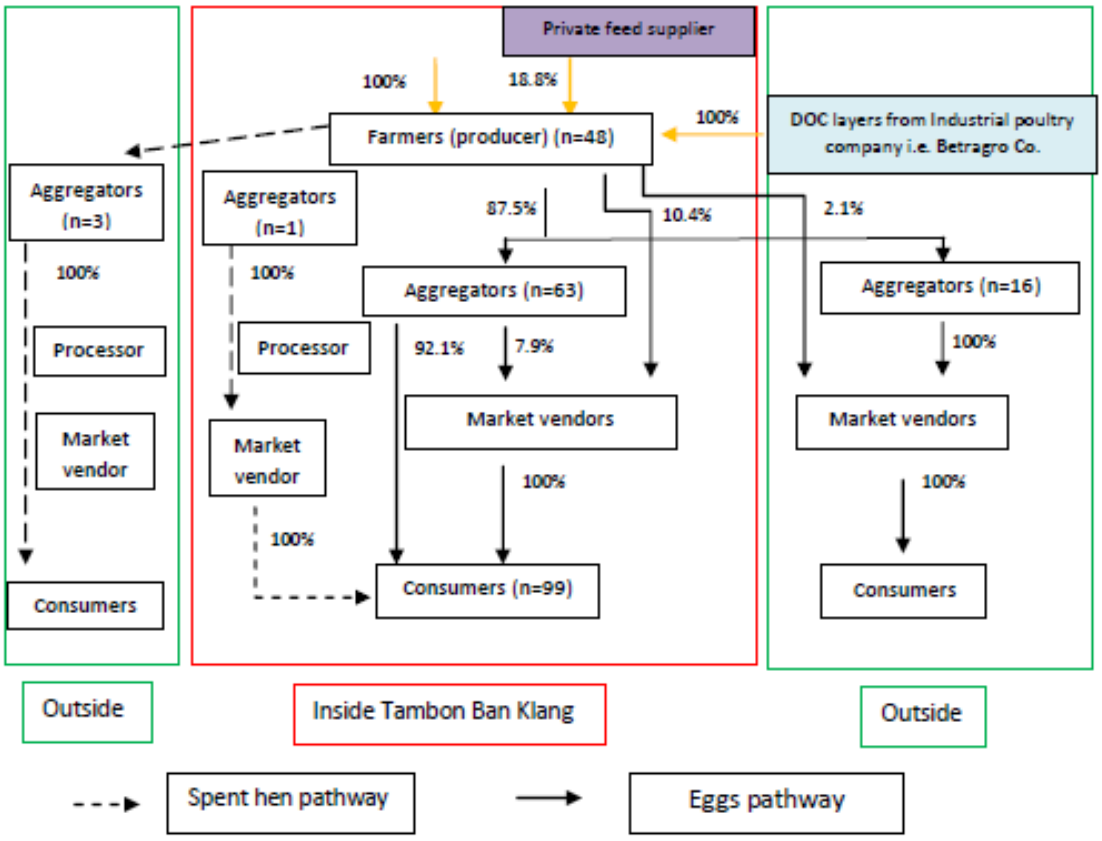


Figure 6. Layer market pathway of Tambon Ban Klang by poultry product types and location of poultry products trade.

Some actors played more than one role. It was observed by the researcher that 6 of 48 farmers (12.5%) were also traders (aggregator/market vendor). Five of them (10.4%) traded products inside Tambon Ban Klang, while one farmers (2.1%) traded products to other provinces. Fifty eight of sixty three aggregators (92.1%) who lived inside the Tambon Ban Klang also played market vendor roles. All the aggregators who lived outside of the Tambon Ban Klang (n=16) and five aggregators who lived inside of the Tambon Ban Klang played only the trader role.

Some farmers played both the producer and trader roles because of the benefits of the price gap during the pathway channel. They were able to sell all of their products directly to the market. This benefit was the same for aggregators who also played a market vendor role. The farmers had a verbal agreement with permanent buyers to sell a constant quantity of the products. In cases where the farmers increased their production, they asked the active buyer first before selling to others.

The aggregators who came from outside the study area, especially from other provinces, bought a large quantity of products each time but less frequently than inside aggregators (once a week or every two weeks). One farm usually served as a collecting place for products from several farms for outside aggregators to pick up. In contrast, inside the Tambon Ban Klang, aggregators always bought the products directly from each farm. They might buy the products every day or at least two times a week. Aggregators inside the Tambon Ban Klang who also played a market vendor role bought the products more often than those only in an aggregator role.

In the spent hen pathway, a total of three aggregators were from outside the study area, and one lived in the Tambon Ban Klang. The outside aggregators played all the roles of

aggregator, processor and market vendor, while the aggregator inside Ban Klang played only aggregator and processor roles. Unhealthy chickens were the majority of those that were processed by the aggregator inside Tambon Ban Klang because healthy spent hens were sold to the outside aggregators. The farmers would sell their entire house of spent hens within 2-3 days to an aggregator, or they would sometimes sell to two or three aggregators within a day.

4.1.3 Cross border-trade

Only three immigration checkpoints within the study area are available for Lao people to cross the border to purchase Thai poultry products. These checkpoints are located in Nakhon Phanom Mueang District (number 1), Tha Uthen District (number 3), and That Phanom District (number 5) (Figure 4.). At these checkpoints, Lao people can buy or sell products, but they cannot stay in Thailand overnight. Lao people cross the Mekong River to Thailand by a boat that embarks every half an hour from 6 a.m. to 6 p.m. Each immigration checkpoint is open twice a week. Lao traders can purchase eggs only in small quantities each trading day (fewer than 30 egg trays) because of the inconvenience of transportation by boat and the limited days the checkpoints are open (Figure 7). These Lao traders also play a market vendor role; they sell eggs at the Lao local market since it is the only way they can make a profit. Lao aggregators demand a large quantity of eggs that they usually purchase from layer farms in Laos because the egg prices are cheaper and transportation is more convenient. Interestingly, the poultry industry in Lao is operated and owned by Thai poultry producers.

Figure7. Cross border transportation by boat at immigration checkpoints.

4.1.4 The Risk of Transmission AI along the poultry market pathway (Table 4.)

Farmers

The survey showed that farmers transported poultry products and animal feed in open trucks a majority of the time. There were two trade directions: 1) buyer picks up products at the farm; and 2) farmer sends his products to the buyer's place. Some farmers delivered the poultry products to an aggregator themselves, while others needed aggregators to buy the product at the farm.

Only plastic containers were used for trading spent hens and for disposal of layer manure, while plastic or paper egg trays were used for eggs. Buyers brought all of their own plastic containers for transporting spent hens that they bought at the farm. Some farmers used their own plastic containers within the farm area and brought spent hens to the buyer at selling points outside of the chicken house. Many farmers, however, used within the farm area the same plastic containers that were brought by the buyer.

The plastic egg trays belonged to the farmers but were used among the traders. The traders returned these trays back to the farmers at their next purchase. Traders surveyed did not separate egg trays from different farms, and they did not clean the egg trays because they thought

that was the farmers' task. The majority of the farmers used recycled plastic feedbags for containing disposal of layer manure to a buyer, but they seldom reused them to hold the animal feed. However, farmers did reuse plastic bags that had contained animal feed from the Ban Klang feed mill by using the bags in the layer houses. These behaviors carry a possible risk of transmitting the disease among farms because the plastic bags were reused at several different places.

The researcher found that on some farms the person who packaged layer manure for disposal was also the same person who raised the chickens. This is another possible risk for AI transmission. However, only dry layer manure was sold. None of the farmers used layer manure to fertilize plants within their farm.

Sixty percent of farmers separated sick layers from the flock to a quarantine zone, gave supportive treatment, and then returned them back to the flock when they recovered or looked better. If a chicken did not recover, the farmers disposed of it through burying in the farm area or burning in the poultry incinerator. They did not sell sick layers to buyers. Ten percent of farmers did as described above for the disposal of dead birds, but they also sold sick chickens. Approximately 28 percent of farmers, when they found sick layers, separated them from the flock and destroyed them by either burial or burning. Only two percent of them immediately sold their sick chickens to buyers. Ten percent of the farmers sold dead layers to buyers in either whole chicken or processed form. The majority of farmers (67%) destroyed dead layers, while 23% of them consumed dead layers within their household. However, all of the farmers sold small or injured layers either to an inside Tambon Ban Klang processor or directly to consumers at the farm.

The sources of water supplied to the farms were ground water and piped water; no farm used river water. The sewage from these farms penetrated to the ground only. Four of the 48 farms had not passed the layer standards of the Thai Department of Livestock Development (DLD) because these farms started the business after the testing date.

The findings from observations of the normal farm operations (Appendix 1) showed that only one farm raised other poultry, but approximately two-thirds also raised dogs or cats on the farm. Fifteen percent of the farms did not have disinfection equipment for vehicles entering the farm area, disinfection baths for dipping boots before entering the layer house, or disinfectant baths for dipping egg trays. It was also observed that over fifty percent of the farms had disinfection equipment that sat unused.

Over 20% of the egg collecting zones did not have any means to prevent eggs from contacting waterfowl, and approximately three-fifths of the farms did not have nets to prevent the vectors of HPAI from entering the layer houses. In addition, the farmers did not wear gloves when they cleaned the eggshells from chicken feces, but they always washed their hands when they finished work.

Traders (aggregator/market vendor)

Most aggregators used closed trucks to transport poultry products to protect the cargo from rain or sunlight during transportation. The aggregators from inside the study area who also played a market vendor role utilized motor bicycles (Figure 8), even though this type of vehicle cannot transport large numbers of products. There were only 2-3% of traders that transported human and poultry products at the same time, but these traders did not transport other poultry.

Figure 8. A motor bicycle used by an aggregator/market vendor.

Aggregators inside Tambon Ban Klang who also played a market vendor role often bought a small quantity of poultry products from several farms within one day. In this case, aggregators who bought the products from several farms had a higher possibility of transmitting AI than aggregators who collected the products from only one farm. For example, if only one farm had the disease, it would be easily spread by aggregators who went to several farms in one day. In addition, the survey showed that some farms were careless about biosecurity measures, such as spray disinfecting vehicles before entering the farm area.

Processors

Farmers used motor bicycles to transport unhealthy chickens to a processor within Tambon Ban Klang. The farmers used plastic animal feedbags for moving the unhealthy chickens, or if there were fewer than five chickens to be slaughtered they carried them by tying their legs together.

Processors from outside the study area also played trader roles. They used open trucks to transport spent hens from the farm to their house. About 75 to 100 spent hens were transported per round. They used their own plastic containers for the spent hens. The processors used their

backyard as a slaughter area (Figure 9). Until the time of slaughter, processors kept the spent hens temporally in a chicken house (Figure 10) on their property. Processors slaughtered about 20 spent hens per day and either sold them daily at the local market or kept them in a refrigerator for selling later.

Figure 9. A backyard slaughter area for spent hens.

Figure 10. A temporary chicken house for spent hens.

The researcher was surprised to find that the processors managed the by-products, such as carcasses and feathers, by putting them in reused plastic animal feed bags (Figure 11). They

added quicklime with the by-products to ferment into fertilizer. However, they used tap water for cleaning the processing area, and the sewage went into the public wastewater treatment system.

Figure 11. By-product management.

Consumers

The majority of consumers bought eggs and processed spent hens at the local market. Some consumers who lived near a farm always bought the poultry products directly from the farm because they thought it was fresher and cheaper than buying at the market. These consumers would buy live spent hens from the farmer and process the birds themselves to eat for a special event, such as after the agricultural harvest festival. These consumers also used tap water to clean the processing area, and the sewage went into the public wastewater treatment system. Because of the small quantity that they purchased each time, consumers always used motor bicycles or walked to buy the products at the local markets or farms. Plastic bags and plastic or paper egg trays were used for giving the poultry products to the consumers, and these traveled only one way.

Cross border trade

Live poultry cannot be bought or sold at the Lao/Thai immigration checkpoints, according to DLD policy. Thai market vendors have used only paper egg trays for Lao buyers since the first AI outbreak occurred in Laos (Figure 12). The researcher found that the United States Agency for International Development (USAID) has been educating Lao people at these checkpoints regarding the prevention and control of AI transmission since the first outbreak.

Figure 12. Paper trays used for purchasing eggs at the market at the Thai immigration checkpoint.

For example, USAID encouraged Lao market vendors to use paper trays to sell eggs to buyers instead of plastic trays because re-use of plastic trays increases the possibility of AI transmission. They taught the Lao people to wash their hands every time they purchased poultry products, particularly live chickens, and also taught the chicken seller to clean the purchase area after they sold their products. The USAID increased consumer trust to purchase poultry products from the Lao market by conducting several advertising campaigns, as shown by this sign (Figure 13).

Figure 13. Sign declaring that poultry products in this Lao local market are free of AI.

Table 4. Summary the risk of transmission AI along the Ban Klang layer market chain by producers, aggregators, market vendors, consumers and processors.

Risks of transmission	Producers	Aggregators/ Market vendors	Processors	Consumers
Vehicle	used same vehicle to transport animal feed from Ban Klang feed mill through farm area		transported live chicken and human in same vehicle in the same time	
Product containers (egg tray, plastic container)	did not separate containers that were used between within and outside farm area	Did not clean containers before sent it back to farm		
	seldom cleaned containers when get it back from buyer	Did not separate containers from each farm		
	reused animal plastic feed bags between chicken household and Ban Klang feed mill			
Behavior	person who packed layer manure was the same person who raised chicken		Did not have appropriate management with by product such as feather	
	2% of farmers immediately sold sick chicken 10 % of farmers sold sick chicken after tried to treat them 10% of farmers sold dead layers either whole chicken or processed form			
Biosecurity	2% of farmers raised other poultry within farm area 67% of farmers raised dogs or cats within farm area 50% of farm did not have appropiate disinfectant equipment, and over 50% those equipment that sat unused	Did not strict to spray disinfectant to their vehicle before entrane to farm area	the temporary chicken household condition before slaughter was not appropriate and easy to contact with waterfowl No sewage treatment system before went into public wastewater treatment	No sewage treatment system before went into public wastewater treatment

4.1.5 The risk assessment of behavior

Table 5 depicts the number and percentage of each actor along the Ban Klang layer market chain who had been educated and had direct experience with AI since the outbreak in 2006. Farmers were the largest group of people being educated about AI (85.0%). Increased awareness and knowledge about AI was achieved by several organizations following the outbreak in 2006. Nevertheless, only 12.5% of the farmers had direct experience with AI, where their poultry populations were infected or showed clinical signs of AI. Approximately 88% of the farmers indicated that their poultry were destroyed when the outbreak occurred because their farms were within the 5 Km radius of the eradicating area of the infected farms, despite the fact that their poultry did not show any clinical signs at the time. The results of the survey showed that, while 85.0% of farmers being educated regarding AI, 84.9% of consumers who were the end of poultry market chain no being educated regarding AI. The surveyed aggregators and processors indicated that they never had direct experience with AI because they stopped their business immediately when the outbreak began.

Table 5. Results of responses by producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain regarding education and direct experience with AI since the outbreak in 2006.

		Actor				
		Producers (n=48)	Aggregators (n=19)	Market vendors (n=33)	Consumers (n=99)	Processors (n=4)
Have been educated	Yes	41(85.0)	7(36.8)	7(21.2)	15(15.1)	1(25.0)
	No	7(15.0)	12(63.2)	26(78.8)	84(84.9)	3(75.0)
Direct experience	Yes	6(12.5)	0(0.0)	2(6.1)	5(5.0)	0(0.0)
	No	42(87.5)	19(100)	31(93.9)	94(95.0)	4(100.0)

4.1.6 Avian Influenza: knowledge, attitudes, and practices by producers, traders (aggregators/market vendors), processors and consumers

Knowledge about Avian Influenza

Table 6 displays the results of responses to the knowledge questions about AI in the survey of each actor in the Ban Klang layer market chain. Their responses were categorized into three levels: low, medium, and high. The number of knowledge questions was the same for all groups. Thirteen statements tested for knowledge about AI among producers, traders (aggregators/market vendors), processors and consumers.

Producers, respondents who had more training about AI from seminars by related organizations, such as DLD and MOPH, had higher knowledge scores about HPAI than other groups. The majority of producers (79.2%) knew that the virus is the causative agent of AI and that poultry infected with HPAI cannot be treated, while approximately half of traders (47.4% of aggregators, 42.4% of traders) did not know these facts. Most respondents knew that poultry could be infected with AI and transmitted to humans, but less than 20% of them knew that other mammals like dogs and cats could also be infected. Related to interviewers' observation for risk behaviors at the producer level, it showed approximately 67% of the producers (farmers) still raised dogs and cats within layer farm areas.

Approximately three-fourths (70.1%) of the producers knew the major clinical signs of HPAI in infected poultry, while less than half of those surveyed in other groups knew these signs. The majority of producers (70.8%) also were aware of the modes of transmission for HPAI between animals, and from animals to humans. However, approximately 30% of all respondents thought indirect contact with equipment contaminated by secretions from infected animals was not able to transmit HPAI between animals; this belief was especially high among

the traders (26.4% of aggregators, 30.2% of market vendors). About 20% of aggregators also thought humans could not be infected with HPAI from animals.

Although no HPAI human case has been reported by the consumption of eggs, several campaigns recommend to not consume uncooked eggs. Consequently, half of all people surveyed thought they could be infected by HPAI via the consumption of eggs. However, the majority of all people surveyed knew that consuming uncooked meat from sick chickens and uncooked eggs are high-risk behaviors for transmitting HPAI to humans. Only 20% of the people who thought humans could be infected with HPAI from animals did not believe HPAI could be transmitted from person to person. Not all of the people who thought humans could not be infected with HPAI from animals or between humans knew the signs and symptoms of people who might be infected with HPAI.

Approximately 80% of all respondents knew that children and the elderly have the highest susceptibility to AI infection in the contaminated areas. It was observed that most people interviewed believed that farmers, traders, consumers, and businesses that were related to live chickens had the highest risk of infection and transmission of HPAI in the poultry market chain but excluded the businesses that were related to poultry products, such as eggs.

Table 6. Summary of responses to the knowledge questions about AI from producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain survey, 2011.

Statement	Producer (n = 48)	Aggregators (n = 19)	Market vendors (n = 33)	Consumers (n = 99)	Processors (n = 4)
1. The causative agent of Avian Influenza					
Correct answer	38(79.2)	10(52.6)	19(57.6)	58(58.6)	1(25.0)
Incorrect answer	10(20.8)	9(47.4)	14(42.4)	41(41.4)	3(75.0)
2. Animals that can be infected with Avian Influenza					
Correct answer (poultry and mammal)	3(6.3)	4(21.1)	3(9.1)	17(17.2)	0(0.0)
Some correct answer (only chicken/poultry/mammal)	43(89.5)	14(73.6)	29(87.9)	79(79.8)	1(25.0)
Don't know	2(4.2)	1(5.3)	1(3.0)	3(3.0)	3(75.0)
3. The major signs and symptoms of infected poultry from HPAI					
Correct answer	34(70.1)	9(47.4)	11(33.3)	48(48.5)	2(50.0)
Incorrect answer	14(29.9)	10(52.6)	22(66.4)	51(51.5)	2(50.0)
4. The methods to treat infected poultry from HPAI					
Correct answer	44(91.7)	12(63.2)	19(57.6)	86(86.9)	1(25.0)
Incorrect answer	4(8.3)	7(36.8)	14(42.4)	13(13.1)	3(75.0)
5. The transmission modes of HPAI between animals Direct contact with avian or infected animal Direct contact with dead chicken and eat uncooked meat of dead chickens Indirect contact with secretion of infected animals such as feces, saliva, mucus and tear. Indirect contact with contaminated equipment from secretion of infected animals Don't know					
Correct answer (answer 1,2,3 and 4)	34(70.8)	9(47.4)	16(48.5)	67(67.7)	2(50.0)
Some correct answer	13(27.1)	9(47.4)	14(42.4)	25(25.3)	1(25.0)
Don't know	1(2.1)	1(5.2)	3(9.1)	7(7.0)	1(25.0)
6. The HPAI can transmit to eggs					
Correct answer (yes)	25(52.1)	8(42.1)	21(63.6)	58(58.6)	1(25.0)
Incorrect answer (no)	16(33.3)	7(36.8)	9(27.3)	26(26.3)	1(25.0)
Don't know	7(14.6)	4(21.1)	3(9.1)	15(15.1)	2(50.0)

Table 6. Summary of responses to the knowledge questions about AI from producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain survey, 2011.

Statement	Producer (n = 48)	Aggregators (n = 19)	Market vendors (n = 33)	Consumers (n = 99)	Processors (n = 4)
7. The HPAI can transmit from animal to human					
Correct answer (yes)	42(87.5)	15(78.9)	28(84.8)	93(93.9)	2(50.0)
Incorrect answer (no)	2(4.2)	4(21.1)	3(9.1)	4(4.1)	0(0.0)
Don't know **respondents who answer no in statement 7 will be ended answer the statements**	4(8.3)	0(0.0)	2(6.1)	2(2.0)	2(50.0)
8. The HPAI can transmit from person to person					
Correct answer (yes)	37(80.4)	12(80.0)	25(83.3)	81(85.3)	1(25.0)
Incorrect answer (no)	7(15.2)	1(6.7)	1(3.3)	6(6.3)	2(50.0)
Don't know	2(4.4)	2(13.3)	4(13.4)	8(8.4)	1(25.0)
9. The transmission mode of HPAI from animal to human Direct contact with avian or infected animal Direct contact with dead chicken and eat uncooked meat of dead chickens Indirect contact with secretion of infected animals such as feces, saliva, mucus and tear. Indirect contact with contaminated equipment from secretion of infected animals Don't know					
Correct answer (answer 1,2,3 and 4)	37(80.4)	9(60.0)	20(66.7)	74(77.9)	2(50.0)
Some correct answer	8(17.4)	6(40.0)	8(26.6)	19(20.0)	0(0.0)
Don't know	1(2.2)	0(0.0)	2(6.7)	2(2.1)	2(50.0)
10. The signs and symptoms of people who suspect to infect HPAI					
Correct answer	37(80.4)	12(80.0)	23(76.7)	80(84.2)	1(25.0)
Incorrect answer	9(29.6)	3(20.0)	7(23.3)	15(15.8)	3(75.0)
11. The high risk behavior of transmitting HPAI to human					
Correct answer (both eat uncooked meat from chicken and uncooked egg)	40(87.0)	12(80.0)	24(80.0)	81(85.3)	2(50.0)
Some correct answer (eat uncooked meat from sick chicken or eat uncooked egg)	6(13.0)	2(13.3)	4(13.3)	12(12.6)	0(0.0)
Don't know	0(0.0)	1(6.7)	2(6.7)	2(2.1)	2(50.0)

Table 6. Summary of responses to the knowledge questions about AI from producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain survey, 2011.

Statement	Producer (n = 48)	Aggregators (n = 19)	Market vendors (n = 33)	Consumers (n = 99)	Processors (n = 4)
12. The highest susceptibility person to infect Avian Influenza in contaminated areas					
Correct answer (both children and elder)	34(73.9)	12(80.0)	25(83.4)	71(74.7)	2(50.0)
Some correct answer (children or elder)	12(26.1)	2(13.3)	4(13.3)	24(25.3)	2(50.0)
Incorrect answer (adult)	0(0.0)	1(6.7)	1(3.3)	0(0.0)	0(0.0)
13. The actor in the poultry market chain who has the risk of infection and transmit HPAI 1)Farmers 2)Traders(aggregator/market vendor) 3)Business that related with lived chicken 4.Business that related with poultry product 5)Consumer 6)Etc.					
Correct answer (answer 1,2,3, 4 and 5)	19(41.3)	2(13.3)	8(26.7)	19(20.0)	1(25.0)
Some correct answer	26(56.5)	13(86.7)	22(73.3)	76(80.0)	1(25.0)
Don't' know	1(2.2)	0(0.0)	0(0.0)	0(0.0)	2(50.0)

In order to compare each participant's knowledge, each correct response was scored with a point, scores were totaled, and three groups were created for knowledge levels: low, medium, and high. Based on the summary statistics for the knowledge scores(Table 7), producers had the highest percentage of people with a high knowledge level (61.5%), while the processors had the lowest percentage of high-level knowledge (25.0%). In addition, aggregators and processors had a high percentage of low knowledge (36.8%, 50%, respectively). Some of the respondents had an extremely low knowledge level, as some only had one or two correct responses, (Table 7).

Table 7. Tabulation and summary statistics of the knowledge score for producers, aggregators, market vendors, consumers and processors in the Ban Klang layer market chain survey, 2011.

	Actor				
Levels of knowledge	Producers (n=48)	Aggregators (n=19)	Market vendors (n=33)	Consumers (n=99)	Processors (n=4)
Low (0-16)	6(12.5)	7(36.8)	6(18.1)	14(14.1)	2(50.0)
Moderate (17-21)	11(23.0)	4(21.1)	12(36.4)	35(35.4)	1(25.0)
High (22-27)	31(61.5)	8(42.1)	15(45.5)	50(50.5)	1(25.0)
Average	21.3	17.5	19.0	20.4	11.3
SD	4.8	6.0	6.1	4.7	10.9
Median	23.0	18.0	21.0	22.0	10.0
Min	6.0	6.0	3.0	2.0	2.0
Max	26.0	26.0	26.0	26.0	23.0

Attitude toward Avian Influenza

Table 8 shows the number and percentage of each actor regarding their attitudes on AI topics. Their perceptions were categorized into three levels: negative, neutral, and positive. The number of attitude questions was different for each group. There were 22, 24, 22 and 19 items tested for attitude toward AI among producers, traders, processors and consumers, respectively.

It was found that over 80% of all actors agreed that AI can be prevented and that the following behaviors increased the risk of AI infection: direct contact with sick chickens, consuming uncooked meat from sick chickens, and uncooked eggs from a contaminated area. More than 80% also agreed that: AIV can be spread by infected animals especially via secretions, such as feces, saliva, mucus and blood; people who work with poultry or poultry products have a greater risk for becoming infected with AI; they should see a doctor as soon as possible if they suspect they have clinical signs or symptoms of AI infection; prevention of infection and spread of AI can be done by using a disinfectant or soap to clean equipment, cages, clothes, etc.; and lastly, Tambon Ban Klang should have a good surveillance system involving community participation in order to prevent the recurrence of HPAI.

There were, however, different attitudes among the actors for other statements. For example, 87.5% of producers and over 70% of aggregators (73.7%) and consumers (70.7%) agreed that infected chickens could not be treated, while less than 65% of market vendors and processors (63.6% and 50.0%, respectively) agreed with this statement. Producers, aggregators and processors had high percentages (70.8%, 84.2% and 75.0%, respectively) that agreed with the statement that infected humans could be treated, while a lower percentage of market vendors and consumers agreed, approximately 65%. Aggregators were the group that disagreed most with the statement that AI is a harmful disease (21.1%) because it can mutate and cause severe outbreaks among humans.

Over three-fourth of those surveyed agreed with the following statements: waterfowl are a reservoir for AI; infected animals can spread the Avian Influenza virus, even if they don't show clinical signs; and contaminated equipment, cages, plastic feed bags, and clothes can spread AI.

Only the producer and consumer groups had over 80% (81.3% and 87.9%, respectively) agreement for the statement that using the same vehicle to transport poultry and human products increases the risk of AI infection. A majority of producers agreed that they (producers) are the group with the greatest risk of HPAI infection, while the majority of consumers disagreed with the statement.

Some of the statements were asked only to the groups whose activities were directly related to the statement. Three statements were asked among producers, aggregators and market vendors. The first statement was that there should be a policy to destroy all poultry within 5 km of an infected area. Approximately half of the producers disagreed, while over 70% of aggregators and market vendors agreed with this policy. Almost all of them agreed with a policy to destroy poultry only within the infected area, and to increase surveillance and tests for the disease in the surrounding area. Producers disagreed more than the other groups for the statement for compensation of money from the government if their chickens have to be destroyed.

Over 80% of producers agreed with the statement: you must inform the Livestock Officer if your chickens die suddenly or get sick from an unknown cause over the course of more than one day. Approximately 80% of consumers agreed that they must inform the Livestock Officer if live chickens that they buy from a seller are suspected of having symptoms of HPAI. Approximately 80% of both aggregators and market vendors agreed with a statement about creating a law limiting animal movement. Three-fourths of processors agreed with these statements: a law regarding biosecurity is needed at the slaughter house, and the slaughter house should be located away from the community.

The researcher gave two statements to aggregators, market vendors and processors: your group plays an important role to prevent the spread of the disease, and a policy should be made for the quarantine of poultry products when an outbreak of HPAI occurs. Approximately 80% of aggregators and market vendors agreed with the first, while only 25% of processors agreed. A majority of all three groups agreed on the second statement about a need for policy.

Table 8. Summary of responses to the attitude questions about AI from producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain survey, 2011.

Attitudes	Answer	Producers	Aggregators	Market vendors	Consumer	Processors
1. Avian Influenza is a preventable disease	Agree/satisfied	45(93.8)	17(89.5)	31(93.9)	93(93.9)	3(75.0)
	Do not agree/not satisfied	1(2.1)	0(0.0)	1(3.0)	1(1.0)	0(0.0)
	Not sure	2(4.2)	2(10.5)	1(3.0)	5(5.1)	1(25.0)
2. Infected chickens cannot be treated	Agree/satisfied	42(87.5)	14(73.7)	21(63.6)	70(70.7)	2(50.0)
	Do not agree/not satisfied	4(8.3)	4(21.1)	9(27.3)	18(18.2)	1(25.0)
	Not sure	2(4.2)	1(5.3)	3(9.1)	11(11.1)	1(25.0)
3. Infected people cannot be treated	Agree/satisfied	5(10.4)	1(5.3)	8(24.2)	25(25.3)	0(0.0)
	Do not agree/not satisfied	34(70.8)	16(84.2)	22(66.7)	64(64.6)	3(75.0)
	Not sure	9(18.8)	2(10.5)	3(9.1)	10(10.1)	1(25.0)
4. Avian Influenza is a harmful disease because it can mutate and cause severe outbreaks among humans	Agree/satisfied	35(72.9)	12(63.2)	22(66.7)	76(76.8)	1(25.0)
	Do not agree/not satisfied	7(14.6)	4(21.1)	5(15.2)	7(7.1)	1(25.0)
	Not sure	6(12.5)	3(15.8)	6(18.2)	16(16.2)	2(50.0)
5. Waterfowl are a reservoir for Avian Influenza	Agree/satisfied	44(91.7)	13(68.4)	24(72.7)	75(75.8)	2(50.0)
	Do not agree/not satisfied	2(4.2)	4(21.1)	4(12.1)	7(7.1)	1(25.0)
	Not sure	2(4.2)	2(10.5)	5(15.2)	17(17.2)	1(25.0)

Table 8. Summary of responses to the attitude questions about AI from producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain survey, 2011.

Attitudes	Answer	Producers	Aggregators	Market vendors	Consumer	Processors
6. Infected animals can shed Avian Influenza virus, although they don't show clinical signs	Agree/satisfied	43(89.6)	16(84.2)	26(78.8)	74(74.7)	1(25.0)
	Do not agree/not satisfied	1(2.1)	2(10.5)	3(9.1)	7(7.1)	1(25.0)
	Not sure	4(8.3)	1(5.3)	4(12.1)	18(18.2)	2(50.0)
7. Direct contact with sick chickens increases the risk of Avian Influenza infection	Agree/satisfied	48(100)	18(94.7)	30(90.9)	97(98.0)	2(50.0)
	Do not agree/not satisfied	0(0.0)	0(0.0)	2(6.1)	0(0.0)	1(25.0)
	Not sure	0(0.0)	1(5.3)	1(3.0)	2(2.0)	1(25.0)
8. Eating uncooked meat from sick chickens increases the risk of Avian Influenza infection	Agree/satisfied	48(100)	17(89.5)	30(90.9)	95(96.0)	2(50.0)
	Do not agree/not satisfied	0(0.0)	2(10.5)	1(3.0)	2(2.0)	1(25.0)
	Not sure	0(0.0)	0(0.0)	2(6.1)	2(2.0)	1(25.0)
9. Eating uncooked eggs from a contaminated area increases the risk of Avian Influenza infection	Agree/satisfied	45(93.8)	16(84.2)	29(87.9)	95(96.0)	2(50.0)
	Do not agree/not satisfied	1(2.1)	2(10.5)	2(6.1)	1(1.0)	1(25.0)
	Not sure	2(4.2)	1(5.3)	2(6.1)	3(3.0)	1(25.0)
10. Using the same vehicle to transport poultry and humans increases the risk of Avian Influenza infection	Agree/satisfied	39(81.3)	12(63.2)	23(69.7)	87(87.9)	2(50.0)
	Do not agree/not satisfied	8(16.7)	4(21.1)	6(18.2)	8(8.1)	1(25.0)
	Not sure	1(2.1)	3(15.8)	4(12.1)	4(4.0)	1(25.0)

Table 8. Summary of responses to the attitude questions about AI from producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain survey, 2011.

Attitudes	Answer	Producers	Aggregators	Market vendors	Consumer	Processors
11. Contaminated equipment, cages, plastic feed bags, boots, clothes can spread Avian Influenza	Agree/satisfied	45(93.8)	14(73.7)	26(78.8)	91(91.9)	3(75.0)
	Do not agree/not satisfied	3(6.3)	2(10.5)	4(12.1)	5(5.1)	0(0.0)
	Not sure	0(0.0)	3(15.8)	3(9.1)	3(3.0)	1(25.0)
12. Infected animals can shed Avian Influenza especially in secretions such as feces, saliva, mucus and blood	Agree/satisfied	47(97.9)	17(89.5)	28(84.8)	92(92.9)	2(50.0)
	Do not agree/not satisfied	1(2.1)	0(0.0)	4(12.1)	2(2.0)	1(25.0)
	Not sure	0(0.0)	2(10.5)	1(3.0)	5(5.1)	1(25.0)
13. People who work with poultry or poultry products have a greater risk for becoming infected with Avian Influenza	Agree/satisfied	46(95.8)	15(78.9)	31(93.9)	95(96.0)	2(50.0)
	Do not agree/not satisfied	2(4.2)	3(15.8)	1(3.0)	1(1.0)	1(25.0)
	Not sure	0(0.0)	1(5.3)	1(3.0)	3(3.0)	1(25.0)
14. If people in poultry-related jobs have clinical signs of high fever, shivering, sore throat, or difficulty breathing, they should see a doctor as soon as possible	Agree/satisfied	48(100)	19(100.0)	33(100.0)	97(98.0)	2(50.0)
	Do not agree/not satisfied	0(0.0)	0(0.0)	0(0.0)	1(1.0)	1(25.0)
	Not sure	0(0.0)	0(0.0)	0(0.0)	1(1.0)	1(25.0)
15. Using a disinfectant or soap to clean equipment, cages, clothes, etc. can prevent infections/spread of Avian Influenza	Agree/satisfied	48(100)	18(94.7)	30(90.9)	94(94.9)	3(75.0)
	Do not agree/not satisfied	0(0.0)	0(0.0)	2(6.1)	3(3.0)	0(0.0)
	Not sure	0(0.0)	1(5.3)	1(3.0)	2(2.0)	1(25.0)

Table 8. Summary of responses to the attitude questions about AI from producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain survey, 2011.

Attitudes	Answer	Producers	Aggregators	Market vendors	Consumer	Processors
16. Your group has a greater risk of HPAI infection	Agree/satisfied	43(89.6)	10(52.6)	22(66.7)	38(38.4)	2(50.0)
	Do not agree/not satisfied	4(8.3)	6(31.6)	7(21.2)	46(46.5)	1(25.0)
	Not sure	1(2.1)	3(15.8)	4(12.1)	15(15.2)	1(25.0)
17. A policy to destroy all poultry within 5 km of an infected area	Agree/satisfied	22(45.8)	14(73.7)	20(60.6)		
	Do not agree/not satisfied	23(47.9)	5(26.3)	11(33.3)		
	Not sure	3(6.3)	0(0.0)	2(6.1)		
18. A policy to destroy poultry only within the infected area, to increase surveillance and test for the disease in the surrounding area	Agree/satisfied	44(91.7)	17(89.5)	31(93.9)		
	Do not agree/not satisfied	3(6.3)	2(10.5)	1(3.0)		
	Not sure	1(2.1)	0(0.0)	1(3.0)		
19. If your chickens die suddenly or get sick from an unknown cause over the course of more than one day, you must inform the Livestock Officer	Agree/satisfied	40(83.3)				
	Do not agree/not satisfied	2(4.2)				
	Not sure	6(12.5)				
20. Your group plays an important role to prevent spread of the disease	Agree/satisfied		16(84.2)	26(78.8)		1(25.0)
	Do not agree/not satisfied		3(15.8)	2(6.1)		1(25.0)
	Not sure		0(0.0)	5(15.2)		2(50.0)

Table 8. Summary of responses to the attitude questions about AI from producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain survey, 2011.

Attitudes	Answer	Producers	Aggregators	Market vendors	Consumer	Processors
21. A law of animal movement	Agree/satisfied		16(84.2)	26(78.8)		
	Do not agree/not satisfied		2(10.5)	5(15.2)		
	Not sure		1(5.3)	2(6.1)		
22. A policy for the quarantine poultry product when the outbreak of HPAI occur	Agree/satisfied		14(73.7)	27(81.8)		3(75.0)
	Do not agree/not satisfied		3(15.8)	5(15.2)		1(25.0)
	Not sure		2(10.5)	1(3.0)		0(0.0)
23. If live chicken that you buy from a seller have suspected symptom of HPAI, you must inform Livestock officer	Agree/satisfied				78(78.8)	
	Do not agree/not satisfied				7(7.1)	
	Not sure				14(14.1)	
24. A law of bio-security of the slaughter house	Agree/satisfied					3(75.0)
	Do not agree/not satisfied					1(25.0)
	Not sure					0(0.0)
25. The slaughter house should be located away from the community	Agree/satisfied					3(75.0)
	Do not agree/not satisfied					1(25.0)
	Not sure					0(0.0)

Table 8. Summary of responses to the attitude questions about AI from producers, aggregators, market vendors, consumers and processors of the Ban Klang layer market chain survey, 2011.

Attitudes	Answer	Producers	Aggregators	Market vendors	Consumer	Processors
26. The compensation money from the government if your chickens have to be destroyed	Agree/satisfied	39(81.3)	18(94.7)	24(72.7)		
	Do not agree/not satisfied	8(16.7)	1(5.3)	2(6.1)		
	Not sure	1(2.1)	0(0.0)	7(21.2)		
27. Ban Klnag Sub-district is at risk for HPAI to reoccur	Agree/satisfied	16(33.3)	9(47.4)	20(60.6)	61(61.6)	0(0.0)
	Do not agree/not satisfied	24(50.0)	8(42.1)	8(24.2)	19(19.2)	4(100.0)
	Not sure	8(16.7)	2(10.5)	5(15.2)	19(19.2)	0(0.0)
28. Ban Klang Sub-district should have a good surveillance system involving community participation in order to prevent recurrence of HPAI	Agree/satisfied	48(100.0)	19(100.0)	30(90.9)	96(97.0)	4(100.0)
	Do not agree/not satisfied	0(0.0)	0(0.0)	2(6.1)	3(3.0)	0(0.0)
	Not sure	0(0.0)	0(0.0)	1(3.0)	0(0.0)	(0.0)

To compare among actors, the researcher scored the attitude levels with points and grouped the total scores by applying the Bloom's method into three levels of attitude: negative, neutral, and positive. According the difference in the number of questions among actors, the attitude scores were standardized by an adjusting factor. These results (Table 9) showed that consumers had the highest percentage of positive attitudes (94.0%), while the processors had the lowest percentage (50.0%). In addition, the processor group was the only one that had a negative attitude (25.0%) among all actors.

Table 9. Tabulation and summary statistics of the standardized* attitude score for producers, aggregators, market vendors, consumers and processors in the Ban Klang layer market chain survey, 2011.

	Actor				
Levels of Attitude	Producers (n=48)	Aggregators (n=19)	Market vendors (n=33)	Consumers (n=99)	Processors (n=4)
Negative (0-43)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(25.0)
Neutral (44-57)	4(8.3)	4(21.1)	4(12.1)	6(6.0)	1(25.0)
Positive (58-72)	44(91.7)	15(78.9)	29(87.9)	93(94.0)	2(50.0)
Average	66.4	64.3	64.3	65.8	55.0
SD	4.3	6.1	5.3	4.3	15.5
Median	67.6	65.0	66.0	66.8	57.8
Min	52.3	49.0	49.0	50.4	34.9
Max	71.9	72.0	71.0	71.8	69.8

* Because the number of questions regarding attitudes differed among the actor groups, the attitude score was standardized to the maximum possible score for aggregators (72).

Practice toward Avian Influenza

Tables 10 through 14 show the answers of farmers, traders (aggregators/market vendors), consumers, and processors regarding their practice behaviors to prevent AI. These behaviors were categorized into three levels: low, medium and high. Each group was given a different

number of practical questions depending on their related practical behavior regarding AIV in the poultry market chain. There were 13 practical behavior questions for producers, 7 for traders, 6 for consumers and 12 for processors.

As the results in table 10 show, although almost all of the producers did not raise other poultry on their farm, approximately 60% of them had raised other animals, such as dogs or cats, within the farm area. Over 80% of farmers always properly protected themselves before contact with sick or dead chickens, and when finished they washed their hands and equipment with soap and disinfectant. The percentage of producers who used disinfectants on egg trays that came from outside the farm was 90%, while the number that dipped their boots before entering layer houses and sprayed vehicles before entering the farm area decreased to 70%. Over 90% of producers separated egg trays used inside the farm from those that came from outside, asked DLD for permission to move DOC before using them as replacements on their farm, and sought the help from physicians when a household member had flu-like symptoms. Nevertheless, approximately 10% of these processors never got an annual health examination and never reported to the livestock officer when sudden unexplained deaths occurred among their chickens over more than one day.

As the results in Table 11 show, the majority of traders (aggregators/market vendors) never washed egg trays with disinfectant before use, and aggregators had an even higher percentage for this practice than market vendors. Likewise, the majority of both groups never sprayed disinfectant on their vehicles before entering farms. However, over 50% of aggregators separated egg trays that were used inside versus outside of the farm, while over 65% of market vendors never did this practice. Approximately 60% of aggregators always used their own packaging, while 52% of market vendors never did. The majority of both groups never returned

poultry products to producers when they could not sell all of the products they bought, which is a risk pathway for transmission disease. Although they always went to see a doctor when a household member had flu-like symptoms, market vendors had a higher percentage to never get an annual health examination as compared to aggregators.

Table 10. Results of practical behavior responses from farmers in the Ban Klang layer market chain survey, 2011.

	At all times	Sometimes	No
1. Do you raise other poultry on your farm?	1(2.1)	0(0.0)	47(97.9)
2. Do you raise other animals such as dogs or cats on your farm?	28(58.4)	4(8.3)	16(33.3)
3. Do you properly protect yourself before contacting sick or dead chickens by wearing personal protection equipment such as a mask, gloves, an apron and boots?	39(81.3)	9(18.7)	0(0.0)
4. When you finish your work, do you wash your hands and any equipment used with the chickens?	46(95.8)	2(4.2)	0(0.0)
5. Do you use soap or disinfectant to clean your hands and equipment?	45(93.8)	3(6.2)	0(0.0)
6. Do you use disinfectant to dip/wash any egg trays that you get from the outside?	43(89.6)	5(10.4)	0(0.0)
7. Do you dip your boots in disinfectant before entering the layer house?	40(83.3)	6(12.5)	2(4.2)
8. Do you spray disinfectant on vehicles before they enter your farm?	34(70.8)	10(20.9)	4(8.3)
9. Do you separate egg trays inside the farm from those that come from the outside?	47(97.9)	0(0.0)	1(2.1)
10. 10. Do you ask for permission of movement Day Old Chick from DLD before replacement in your farm?	44(91.7)	0(0.0)	4(8.3)
11. 11. If household member had flu-like symptoms, would you seek the help of a physician right away?	47(97.9)	1(2.1)	0(0.0)
12. 12. Do your workers who handle the poultry or poultry products have a heath check every year?	38(79.2)	5(10.4)	5(10.4)
13. 13. If sudden unexplained deaths occur among your chickens over more than one day, do you report it to the livestock officer?	40(83.3)	3(6.2)	5(10.4)

Table 11. Results of practical behavior responses from traders in the Ban Klang layer market chain survey, 2011.

	At all times	Sometimes	No
1. Do you dip/wash egg trays with disinfectant before reusing it?			
Aggregators	2(10.6)	0(0.0)	17(89.4)
Market vendors	5(18.5)	5(18.5)	17(63.0)
2. Do you spray disinfectant on vehicles before they enter your farm?			
Aggregators	1(5.3)	4(21.0)	14(73.7)
Market vendors	5(18.5)	3(11.1)	19(70.4)
3. Do you separate egg trays that come from inside the farm from those that come from the outside?			
Aggregators	10(52.6)	0(0.0)	9(47.4)
Market vendors	6(22.2)	3(11.1)	18(66.7)
4. Do you use your own packaging, such as egg trays, cages?			
Aggregators	11(57.9)	2(10.5)	6(31.6)
Market vendors	10(37.0)	3(11.1)	14(51.9)
5. Do you return poultry products to seller if you can't sell all of them?			
Aggregators	1(5.3)	1(5.3)	17(89.4)
Market vendors	4(14.8)	2(7.4)	21(77.8)
6. If a household member had flu-like symptoms, would you seek the help of a physician right away?			
Aggregators	16(84.1)	2(10.6)	1(5.3)
Market vendors	23(85.2)	4(14.8)	0(0.0)
7. Do your workers who handle the poultry or poultry products have a health check every year?			
Aggregators	12(63.1)	6(31.6)	1(5.3)
Market vendors	15(55.6)	6(22.2)	6(22.2)

The results for consumers were divided into two groups: (1) consumers who slaughtered chickens themselves, and (2) consumers who did not slaughter chickens themselves. The majority of the first group protected themselves before contacting sick or dead chickens by wearing personal protection equipment. Almost 73% of them washed their hands and equipment that they used with chickens every time, but less than 50% said they cleaned using soap or disinfectant. However, a majority of both groups of consumers ate cooked chicken and cooked eggs, went to see a doctor when a household member had flu-like symptoms, and reported to officers when they saw suspected H5N1 chickens(Table 12).

Table 12. Results of practical behavior responses from consumers in the Ban Klang layer market chain survey, 2011.

	At all times	Sometimes	No
** if you do not slaughter chickens yourself, please skip to 4**			
1. Do you properly protect yourself before contacting sick or dead chickens by wearing personal protection equipment such as a mask, gloves, an apron and boots? Group 1	2(18.2)	5(45.5)	4(36.3)
2. When you finish your work, do you wash your hands and any equipment used with the chickens? Group 1	8(72.7)	3(27.3)	0(0.0)
3. Do you use soap or disinfectant to clean your hands and equipment? Group 1	5(45.5)	5(45.5)	1(9.0)
4. Do you eat cooked chicken and cooked egg?			
Group 1	10(90.9)	1(9.1)	0(0.0)
Group 2	85(96.6)	3(3.4)	0(0.0)
5. If a household member had flu-like symptoms, would you seek the help of a physician right away?			
Group 1	9(81.8)	2(18.2)	0(0.0)
Group 2	82(93.2)	5(5.7)	1(1.1)
6. Do you report to a livestock officer when you see suspect H5N1 chickens?			
Group 1	9(81.8)	2(18.2)	0(0.0)
Group 2	64(72.7)	11(12.5)	13(14.8)

As shown in Table 13, no processor ever protected him- or herself before contacting sick or dead chickens by wearing personal protection equipment. But, all of them did wash their hands and equipment and cleaned with soap or disinfectant, and sought help from a physician when a household member had flu-like symptoms. However, all processors only sometimes sprayed disinfectant on their vehicle before going out of the processing area. Processors never used their own packaging, checked their standards of processing with the DLD, or returned poultry products to sellers when they could not sell all of them. Processors never used the same vehicle to transport live chickens with other poultry products, while half of them used the same vehicle to transport poultry and human products together. No processor reported having an

annual health check or reported to a livestock officer when sudden unexplained deaths occurred among chickens during transportation.

Table 13. Results of practical behavior responses from processors in the Ban Klang layer market chain survey, 2011.

	At all times	Sometimes	No
1. Do you properly protect yourself before contacting sick or dead chickens by wearing personal protection equipment such as a mask, gloves, an apron and boots?	3(75.0)	1(25.0)	0(0.0)
2. When you finish your work, do you wash your hands and any equipment used with the chickens?	4(100.0)	0(0.0)	0(0.0)
3. Do you use soap or disinfectant to clean your hands and equipment?	4(100.0)	(0.0)	0(0.0)
4. Do you spray disinfectant on vehicles before they go out from processing area?	0(0.0)	4(100.0)	0(0.0)
5. Do you use your own packaging such as cage?	3(75.0)	0(0.0)	1(25.0)
6. Do you check your standards of processing with the DLD?	0(0.0)	3(75.0)	1(25.0)
7. Do you use same vehicle to transport chicken and other poultry?	0(0.0)	(0.0)	4(100.0)
8. Do you use same vehicle to transport poultry and humans?	0(0.0)	2(50.0)	2(50.0)
9. If household member had flu-like symptoms, would you seek the help of a physician right away?	4(100.0)	0(0.0)	0(0.0)
10. Do you return poultry products to seller if you can't sell all of them?	0(0.0)	0(0.0)	4(100.0)
11. Do your workers who process the poultry have a heath check every year?	3(75.0)	0(0.0)	1(25.0)
12. If sudden unexplained deaths occur among your chickens during transportation, do you report it to the livestock officer?	2(50.0)	1(25.0)	1(25.0)

To compare results among participants, the researcher scored answers to the practical behavior questions with points, then grouped the total scores by applying Bloom's method into three levels of practice: low, moderate, high. According the difference in the number of questions among actors, the practice scores were standardized by an adjusting factor. The results (Table 14) showed that producers had the highest percentage of individuals with a high practical level (91.7%), while the processors had the lowest percentage (0.0%). However, the trader group

(aggregators/market vendors) had the highest percentage of individuals that had a low practical level regarding preventing AI (26.3% and 44.4%, respectively). Among all participants, the majority had a moderate practical level.

Table 14. Tabulation and summary statistics of the standardized* practice score for producers, aggregators, market vendors, consumers and processors in the Ban Klang layer market chain survey, 2011.

	Actor				
Levels of Practice	Producers (n=48)	Aggregators (n=19)	Market vendors (n=33**)	Consumers (n= 99)	Processors (n=4)
Low (0-22)	0(0.0)	5(26.3)	12(44.4)	1 (1.0)	0(0.0)
Moderate (23-31)	4(8.3)	9(47.4)	11(40.8)	16(16.2)	4(100.0)
High (32-39)	44(91.7)	5(26.3)	4(14.8)	82(82.8)	0(0.0)
Average	35.9	27.8	26.4	36.7	27.3
SD	2.7	4.2	4.2	3.8	1.8
Median	37.0	27.8	25.9	38.9	27.5
Min	28.0	20.4	18.5	21.7	24.8
Max	39.0	38.9	37.0	39.0	29.2

* Because the number of questions regarding practice behavior differed among the actor groups, the practice behavior score was standardized to the maximum possible score for producers (39).

** 6 missing

The association between knowledge and attitude, knowledge and practice, and attitude and practice

Sperman's rank correlation coefficient was used to estimate the association between knowledge, attitude and practice regarding avian influenza among producers, aggregators, market vendors, consumers and processors (Table 15). Aggregators had highest positive correlations between knowledge and attitude (Spearman's rho: 0.815) while processors, producers, market vendors and consumers had lower positive correlation between knowledge and

attitude (Spearman's rho: 0.738, 0.672, 0.560, 0.240, respectively). The positive association between knowledge and practice (K&P) was low among producers and market vendors (Spearman's rho: 0.270 and 0.152, respectively), while there was a high negative correlation for processors (Spearman's rho: -0.949). In addition, the association between attitude and practice (A&P) was low and positive among consumers and producers (Spearman's rho: 0.229 and 0.140, respectively), while it was high negative in processors (Spearman's rho: -0.600).

Table 15. Spearman's rank correlation coefficients between knowledge, attitude, and practice among producers, aggregators, market vendors, consumers and processors in the Ban Klang layer market chain survey, 2011.

Actor	Knowledge and Attitude	Knowledge and Practice	Attitude and Practice
Producers	0.672[a]	0.270[a]	0.140
Aggregators	0.815[a]	-0.019	-0.047
Market vendors	0.560[a]	0.152	-0.108
Consumers	0.240[a]	-0.109	0.229[a]
Processors	0.738	-0.949	-0.600

[a] statistically significant ($p \leq 0.05$)

The comparison of knowledge, attitude and practice among producers, aggregators, market vendors, consumers and processors

The Kruskal-Wallis test was used to evaluate the difference in knowledge, attitude and practice regarding avian influenza among the actor categories (Table 16). A difference both knowledge and practice scores was found among actors (p-value = 0.011 and p-value < 0.001, respectively); there was no difference of attitude among actors (p-value = 0.196). The Mann-Whitney test was used to evaluate differences between two actors after the Kruskal-Wallis test result was significant ($p<0.05$). There were significant differences of knowledge score between producers-aggregators (p-value = 0.011), producers-market vendors (p-value = 0.037),

producers-processors (p-value = 0.036) and aggregators-consumers (p-value = 0.045). The practice score showed a significant difference between producers-aggregators (p-value < 0.001), producers-market vendors (p-value < 0.001), producers-processors (p-value = 0.001) and aggregators-consumers (p-value < 0.001).

Table 16. Results of the statistic to differentiate knowledge, attitude and practice among producers, aggregators, market vendors, consumers and processors in the Ban Klang layer market chain survey, 2011.

Actor	Knowledge	Attitude	Practice
All actors[1]	0.011*	0.196	< 0.001*
Producers [a]	$0.011^{a,b}$, $0.037^{a,c}$, $0.036^{a,e}$	-	$< 0.001^{a,b}$, $< 0.001^{a,c}$, $0.001^{a,e}$
Aggregators [b]	$0.045^{b,d}$	-	$< 0.001^{b,d}$
Market vendors [c]	-	-	$< 0.001^{c,d}$
Consumers [d]	-	-	$0.001^{d,e}$
Processors [e]	-	-	-

[1] p-value of the Kruskul-Wallis test , *significantly different at significance level 0.05.

Value with the different superscript are significantly different by Mann-Whitney test ($p \leq 0.05$).

The association between factors (gender, age, educational level, education and direct experience regarding AI) with knowledge, attitude, and practice toward avian Influenza among producers, aggregators, market vendors, consumers and processors.

According to the relationship between knowledge, attitude and practice described by Manoonpeju (1988), practice is the primary outcome of this study. The association between knowledge, attitude and practice regarding AI among actors in the poultry market chain, however, was not congruent with the four types of KAP relationship model by Manoonpeju conclusion (1988). Five variables (gender, age, educational level, education and direct

experience regarding AI) were studied to find their association on knowledge attitude and practice among each actor in the layer poultry market chain.

The study showed that gender had an association with the knowledge, attitude and practice behavior toward avian influenza of producers, while educational level associated with their knowledge and attitude. In addition, age associated with producers' previous education regarding to AI. Direct experience regarding AI had an association with the knowledge of market vendors, while previous education toward AI associated with their practice behavior. Among consumers, age and educational level had an association with knowledge, while attitude associated with their previous education regarding to AI (Table 17).

Table 17. Number (percentage) of variables (gender, age, education level, education and direct experience regarding AI) and statistic test[1,2] between knowledge and attitude with these variables among producers, aggregators, market vendors, consumers and processors in the Ban Klang layer market chain survey, 2011.

	Producers (n = 48)	Aggregators (n = 19)	Market vendors (n = 33)	Consumers (n= 99)	Processors (n= 4)
Gender					
Male	25.0 (52.1)	13.0 (68.4)	5.0 (15.2)	21.0 (21.2)	1.0 (25.0)
Female	23.0 (47.9)	6.0 (31.6)	28.0 (84.8)	78.0 (78.8)	3.0 (75.0)
Knowledge					
P-value[1]	0.012*	0.537	0.449	0.101	0.637
Attitude					
P-value[1]	0.010*	0.071	0.940	0.097	0.180
Practice					
P-value[1]	0.028*	0.789	0.424	0.816	0.180

Age					
< 18	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
18-30	8.0 (16.7)	1.0 (5.3)	4.0 (12.2)	22.0 (22.2)	0.0 (0.0)
31-45	16.0 (33.3)	10.0 (52.6)	13.0 (39.4)	38.0 (38.4)	2.0 (50.0)
46-55	22.0 (45.8)	8.0 (42.1)	13.0 (39.4)	39.0 (39.4)	2.0 (50.0)
>55	2.0 (4.2)	0.0 (0.0)	3.0 (9.0)	0.0 (0.0)	0.0 (0.0)
Knowledge					
P-value[1]	0.287	0.633	0.203	0.008*	0.683
P-value[2]	-	-	-		-
Age range 18-30 and 46-55				0.006*	
Age range 31-45 and 46-55				0.032*	
Attitude					
P-value[1]	0.162	0.634	0.318	0.568	1.000
Practice					
P-value[1]	0.044*	0.174	0.466	0.676	0.121
P-value[2]		-	-	-	-
Age range 31-45 and > 55	0.031*				
Age range 46-55 and > 55	0.049*				
Education level					
Elementary	23.0 (47.9)	9.0 (47.4)	20.0 (60.6)	60.0 (60.6)	4.0 (100.0)
High school	23.0 (47.9)	4.0 (21.0)	8.0 (24.2)	28.0 (28.3)	0.0 (0.0)
Diploma	2.0 (4.2)	5.0 (26.3)	3.0 (9.1)	3.0 (3.0)	0.0 (0.0)
Bachelor	0.0 (0.0)	1.0 (5.3)	2.0 (6.1)	8.0 (8.1)	0.0 (0.0)
Higher than Bachelor	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Knowledge					
P-value[1]	0.008*	0.310	0.661	0.050*	-
P-value[2]		-	-		-
Elementary- High school	0.003*			0.042*	
Elementary-Bachelor	-			0.031*	
Attitude					
P-value[1]	0.040*	0.647	0.264	0.644	-
P-value[2]		-	-	-	
Elementary- High school	0.014*				
Practice					
P-value[1]	0.930	0.947	0.146	0.458	-
Have been educated					
Yes	41.0 (85.4)	7.0 (36.8)	7.0 (21.2)	15.0 (15.2)	1.0 (25.0)
No	7.0 (14.6)	12.0 (63.2)	26.0 (78.8)	84.0 (84.8)	3.0 (75.0)
Knowledge					
P-value[1]	0.099	0.899	0.199	0.576	0.346
Attitude					
P-value[1]	0.597	0.865	0.522	0.007*	0.655
Practice					
P-value[1]	0.565	0.367	0.030*	0.934	0.180

Have direct experience					
Yes	6.0 (12.5)	0.0 (0.0)	2.0 (6.1)	5.0 (5.1)	0.0 (0.0)
No	42.0 (87.5)	19.0 (100.0)	31.0 (93.9)	94.0 (94.9)	4.0 (100.0)
Knowledge					
P-value[1]	0.278	-	0.044*	0.547	-
Attitude					
P-value[1]	0.742	-	0.850	0.917	-
Practice					
P-value[1]	0.410	-	0.120	0.325	-

[1] result of Kruskal-Wallis test [2] result of Mann- Whitney test

*different at 0.05 significance level

4.2 Phase 2: Focus group discussion (FGD)

The researcher applied the FGD as a method to collect data from participants within the community. There were two participant groups: 1) middleman and 2) farmers who play both producer and trader roles in this FGD activity. The data of the FGD were observed and recorded by tape recording and notes. The discussion is summarized by topic below.

4.2.1 Disease-related issues

Both groups had correct knowledge regarding AI. For example, they knew that virus H5N1 is the causative agent of HPAI and that poultry could be infected with AI and transmitted to humans as well as other mammals. They also knew that greenish, swollen wattle and comb or sudden death without clinical signs are major clinical signs of HPAI infection in poultry, and that both direct contact with infected animals and indirect contact with contaminated equipment were able to transmit HPAI between animals and from animals to humans.

Both groups had the same perception of the AI situation and were more aware and prepared should an outbreak occur near to their community. However, the middlemen group would like to continue to buy eggs from the farm during an outbreak, if they can sell eggs to

consumers. Both groups had fears regarding AI because they always worked closely with poultry/poultry products, and some of them lived on a farm or close to a poultry farm. An outbreak of AI will result in lost income because their business cannot be run at that time. Moreover, other members of the community will avoid them.

Since the AI outbreak occurred in Tambon Ban Klang in 2006, the producer group thought that another outbreak would probably happen if they did not use a proper prevention, while the middlemen group thought AI would not occur again in Tambon Ban Klang because they trusted the disease prevention on the farms. Both were satisfied with the village surveillance system and cooperation between producers and middlemen to prevent AI in response to AI news, such as spraying disinfectant to vehicles and humans each time before allowing entrance to the farm area, and cleaning egg trays before reusing.

4.2.2 Control related issues

During the recent outbreak AI, information was given to the community by the provincial livestock officers, village health staff, Ban Klang layer's chairman, related organizations, farm neighbors and social media. The middlemen coped with the AI situation by stopping buying or by returning poultry products to farms for destruction because they did not want the disease to spread. They also waited for the poultry product movement policy from DLD before they started their business again. This reaction was similar for the producer group: they stopped all activities on the farm, sprayed disinfectant, asked the provincial livestock officers to investigate dead poultry, and cooperated well with livestock officers to control the outbreak. In addition, any who that also acted as traders stopped selling poultry products.

Following the outbreak, the majority of compensation was given to producers rather than middlemen. For example, the government compensated producers with the entire value of chickens, egg products and animal feed that were destroyed. Producers were helped by the provincial livestock officers to reconstruct the farm layout for reaching required biosecurity standards such as increasing the distance between each layer house, decreasing the number of layers per house and separating sick chickens to a quarantine area for treatment or destruction without bringing them back to the flock. In addition, producers received financial support from banks by getting the loans without interest for the first few years after re-starting business. In contrast, middlemen did not get any compensation because their products were not destroyed, although they could not conduct business during the outbreak period. Overall, producers were satisfied with the support from many organizations, but they felt uncomfortable when the price of chicken products was controlled by the department of internal trade of Thailand.

4.2.3 Participation from community related issues

Producers trust the chairman of Ban Klang's layer cooperative and the Nakhon Phanom livestock officers because they have definitely helped producers since the AI outbreak occurred in 2006, while producers distrust the Ban Klang Subdistrict Administrative Organization and would like to verify its work. The producers would be pleased to participate if requested by either the chairman of Ban Klang's layer cooperative or the Naknon Phanom livestock officers. Their participation in community activities depended on the current situation and the closeness of their relationship with those project leaders. For example, in order to prevent the introduction of AI, producers strictly follow the instructions of the Nakhon Phanom livestock officers, such as

spraying disinfectant within their own farm area every two weeks and spraying disinfectant on the shared road areas every two months.

The middlemen trust the chairman of Ban Klang's layer cooperative, the producers, the leader of Tambon Ban Klang and the Nakhon Phanom livestock officers. However, the main inspiration for participation in community activities comes from how much it is related to their business, and the closeness of their relationship with the producers or villagers. In case of prevention of AI, the middlemen help by cleaning chicken manure from the egg shells.

According to the Ban Klang's egg collection center project, producers have a willingness to participate because they think that the egg collection center can shore up the egg price, increase market demand, and prevent the disease from spreading via vehicles that go through farm areas. However, producers who also are middleman think this project will decrease their benefit from the price gap between market channels because they would need to buy their own product through the egg collection center at the higher price. Middlemen agreed with this project in that it was more convenient to collect eggs in one place, although they worried that they may get fewer egg products to sell than before. Overall, both actors said that the community activities will succeed if they understand each other.

CHAPTER V

DISCUSSION

The research was conducted at Tambon Ban Klang, Nakhon Phanom Meaung District, Nakhon Phanom Province where an AI outbreak occurred in July 2006. There were 203 participants in the study including 48 layer farmers, 19 aggregators, 33 market vendors, 99 consumers and 4 processors. The number of respondents indicated a high level of participation from the community, especially among the farmers who had almost 100 percent (48 of 49 total Ban Klang layer farmers) and all processors participation in this study.

5.1 Discussion of research methodology

Research design and research instrument

With respect to the objective of the study, two consecutive phases of a cross-sectional analytic study were designed. Sets of constructed questionnaires were applied for data collection. The first draft of the questionnaire was assessed by the thesis advisor for content and valid construction. The content and wording of the questionnaire was then pre-tested with a random selection of five farmers, two aggregators, three market vendors, ten consumers and one processor. Because the pre-test sample size was small and randomly selected from the same population as the study area, the reliability of the questionnaire data could not be checked by the Cronbach's alpha coefficient method. However, the questionnaire was edited to contain proper content and wording for each actor in the poultry market chain. At the suggestion of a chairman of the Ban-Klang layer feed group, questions about farmers' daily work patterns were also

included in the questionnaire. Finally, the revised questionnaire was reorganized before data collection began.

Sampling scheme

Snowball sampling was used to identify the Ban Klang layer market chain pathway, which had not been previously described. Although the snowball technique does not yield a random sample because of potential biases present in the process, it is a method typically used with unknown or rare populations (Atkinson and Flint 2001). Snowball sampling is also an inexpensive, simple and cost-effective technique (John, 2009). Nevertheless, the bias from random sampling was reduced in this study because almost all farmers, aggregators, and all processors participated.

Convenience and random sampling techniques were used in some actors such as market vendors because their business is always move around; therefore, some bias could occur in this group. For example, market vendors who lived in Tambon Ban Klang were, for the most part, selected more heavily than vendors from other subdistricts. This was due to convenience for the researcher to be able to visit their living place as well as the farm in order to collect data. Consumers were randomly selected at either a farm or retail store that sold Ban Klang layer products. All the professors whose work were related to the Ban Klang layers were selected for this study. There was a total of four processors, three of whom lived in other subdistricts.

In addition, the results of phase 1 showed that the processor group had the highest possibility of introduction and transmission of HPAI along the Ban Klang layer market chain from their lowest KAP level. However, trader groups (aggregators/market vendors) were selected instead to continue the study in phase 2 (FGD). This was done for several reasons,

including: more frequent movement of their business, large enough sample size and the convenience for the researcher to study. The study showed that traders had the highest frequency of movement between farms, and because they also had a larger population than the processor group, they had a greater chance to increase the risk of transmission along the market chain.

The FGD is part of a community-based approach that was applied in this study to motivate participants to openly show their opinions along the constructed questions in the activity. In-depth information that was collected from the FGD, however, because there was no comparison between pre-test and post-test in this study the data supplies only the background for future community-based studies in this community. Due to the date, time and place of the FGD activity, only traders who lived in Tambon Ban Klang had the willingness to participate. Therefore, a bias is possible from this activity, because the information from actors who live outside of Tambon Ban Klang was missed.

5.2 Discussion of research finding

Phase 1

The first objective: To describe the poultry market chain and trade pathways for layer producers in Tambon Ban Klang and surrounding areas.

1) Ban Klang layer market chain and trade pathway

Ban Klang layer farms are categorized among commercial poultry production systems as having low to minimal biosecurity (sector 3) by FAO definitions (FAO 2004). Three production pathways—eggs, spent hens and layer manure disposal pathway—were summarized in the Ban Klang layer market chain. The study showed that there was more trade movement in the egg

production pathway than in the spent hens or layer manure disposal pathways because of higher consumption demand of egg and shorter shelf life than other products. Eggs were traded every day, while spent hens and layer manure are commonly traded about every three or four months.

Eggs and layer manure were mainly supplied within the Tambon Ban Klang, while spent hens were predominately supplied from other subdistricts. Normally, products will be supplied by demand and be traded inside before outside producing area. Living area of middlemen, however, had affected to trading product partway. In this study, because of the high demand of eggs and layer manure inside Tambon Ban Klang, these products were mainly supplied inside Tambon Ban Klang. There was less demand of spent hens because the market for spent hen products is limited to the consumer group that prefers the taste and is willing to purchase spent hens for a higher price than broiler products. Therefore, majority of spent hens was traded to other subdistrict by outside middlemen.

Only a few eggs produced by Ban Klang layers were traded to Lao at immigration checkpoints by Lao market vendors because of the inconvenient of transportation by boat. Eggs were traded to a small village near checkpoints. There was neither trading of spent hens nor disposal of layer manure from Tambon Ban Klang to Laos due to a ban on poultry movements has also been imposed along the Thai-Lao border since the outbreak of HPAI occurred in 2006.

For a disposal layer manure pathway, unfortunately, there was not enough information from producers to link the pathway to other actors. It was probable that producers afraid this information will be published and linked back to them if any disease or outbreak that related to disposal layer manure occur because over 80% of them knew that AI virus can secrete from infected poultry to feces.

Four groups were categorized based on their role in the layer market chain: producers, traders (aggregators/market vendors), consumers and processors. Because the scale of the Ban Klang layer market chain is small, some actors played more than one role, particularly the farmers. This was due to more profit coming from the price gap along the market chain. Some farmers, however, preferred to play only a producer role because they did not want to risk not being able to sell all of the products.

Within the spent hen and layer manure disposal pathways in Ban Klang layer Subdistrict, actors always played more than one role because of the limitation of product, supplies, and market demands. For example, no actors played only a trader role because not enough spent hens were culled per farm at one time to make it worth their costs. The same case was true for the layer manure disposal pathway. Therefore, processors also needed to play the role of trader and buy spent hens from several farms at one time.

The second objective: To analyze the link between the poultry market chain pathways in relation to the potential for introduction and spread of HPAI.

2) The risk of HPAI introduction and transmission along the Ban Klang layer market chain

The survey results of questionnaire

Concern about the layer market chain has risen since the AI outbreak in 2006. The spent hen and layer manure disposal pathways are higher-risk pathways for introduction and transmission of HPAI than the egg products pathway. Several previous studies have illustrated that for HPAI the highest risk transmission modes from animal to humans resulted from direct

contact with infected or dead animals and through consuming uncooked meat from suspect poultry.

The fecal/oral route is the primary avenue of transmitting AI virus among bird populations and from birds to humans, especially via saliva, blood and feces. Therefore, the risk of AI virus transmission is higher in the spent hen and layer manure disposal pathways than in the egg product pathway. In the spent hen pathway, direct contact and consuming uncooked meat from suspect poultry are high-risk routes to transmit AI viruses, while direct contact with poultry feces carries the highest risk of transmitting AI in the layer manure disposal pathway. Direct contact with feces on egg shells or feces in the transporting vehicle also increases the risk of transmitting AI in the egg product pathway. Consumption of uncooked eggs is not recommended, despite the fact that as yet no human case of HPAI has been reported with the consumption of this product.

By actor role, producers have the highest chance of introducing the AI virus into the poultry market chain because they had a higher risk of contracting AI from their constant contact with poultry. Traders are the group with the highest possibility for spreading the disease because their business requires frequent movement. Therefore, surveillance at producer level will provide the best protection against the introduction of AI into the poultry market chain. Traders are also an important group at risk for spreading the disease, especially if an outbreak occurs from their movements.

Several implementations of educational campaigns were applied among producers and consumers by DLD and MOPH. Producers and consumers were most concerned about a possible outbreak because producers are the highest risk group that work closely with poultry, while AI is a zoonotic disease that can be transmitted to consumers by consumption of diseased poultry.

Related to study results, producers and consumers had a higher mean knowledge score than others. It related to the finding that a greater proportion of producers were more being educated regarding AI as compared to other actors. Among consumers, however, it showed a lowest percentage of people being educated about AI from these campaigns. They may have learned from media such as TV. The study showed, the educational level had an effect to the knowledge regarding AI among producers and consumers, while there was no significant association between previous being educated about AI and knowledge.

This study showed the accomplish of surveillance at the producer level, while at trader level need more concern because they had a lower level of knowledge than others. Traders have an important role in the poultry market chain because their movements carry a high risk for spreading the disease. In addition, living area had an effect to the knowledge level of actors because traders and processors who lived outside Tambon Ban Klang, where the outbreak occurred in 2006, seemed to have lower knowledge levels than others actors. It may cause people who lived in the area of the previous outbreak were more aware, being educated about AI and willing to participate in the surveillance system than were people in other areas.

For the relationship between knowledge (K), attitude (A) and practice toward prevention and control of AI (P), the association between KAP was found in the study, but it was not congruent with the four types of KAP relationship model by Manoonpeju conclusion (1988). It may cause by information bias that the actors knew what they should do to prevent and control of AI, but they were afraid to tell their actual doing that against it.

The third objective: To determine the risk of HPAI introduction and transmission along the poultry market chain using a community-based approach (CBA)

The focus group discussion activity

A risk of HPAI introduction and transmission along the poultry market chain was other actors did not realize that they were also an important role that possible to cause the problem. Information gleaned from the FGD activity revealed that other actors expected an efficient system for prevention of HPAI at the producer level. For example, the traders thought that AI would not recur again in the Tambon Ban Klang because they trust the disease prevention at the farm. Producers also realized that a recurrence of AI will probably happen again in their area if they do not use proper prevention.

A key stakeholder is an important person who influences the willingness of the community to participate. Community participation will increase if the activity has an acceptable project leader. In this study, the producers trusted the chairman of Ban Klang's layer feed group, as well as the Nakhon Phanom Provincial livestock officers, because of their eagerness to help since the AI outbreak occurred in 2006. The producers were pleased to participate requested by either the chairman of the Ban Klang's layer feed group or the Naknon Phanom Provincial livestock officers. Their participation in community activities depended on the current situation and their relationship with those project leaders.

In addition, advantageous or disadvantageous effects depend on the willingness of participation from the community. More will participate if they lose less of their benefits. For example, the producers had more willingness to follow the outbreak control policy than the

middlemen because almost all of their loss was compensated by the government, while the middlemen did not get any compensation even though their business was impacted.

Therefore, strategy planning or policy should be revised based on how it impacts all people associated with the issue. Revisions should be made before the plan is announced. This will reduce the reluctance that some people may feel to participate and also minimize future problems. Nevertheless, when the best solution must be implemented even though it may negatively affect some group, the key stakeholder is an important person who can help achieve that goal in the community.

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

Phase 1 part 1. The poultry market chain and trade pathways for layer producers in Ban Klang Subdistrict and surrounding areas.

This study considered four main actors; producers, traders (aggregators/market vendors), consumers and processors, and three main product pathway; eggs, spent hens, and disposal of layer manure, in the Ban Klang layer market chain. Trading movement in egg production pathways occurred every day, while layer manure was traded approximately once every three to four months. The products mainly supplied Tambon Ban Klang by market vendors and were less frequently traded to farther areas when there was a greater demand by aggregators. For cross-border trade, only a small number of eggs produced by Ban Klang layers were traded to Laos at immigration checkpoints by Lao market vendors. There was neither trading of spent hens nor disposal of layer manure from Tambon Ban Klang to Laos. There was only one-way direction for production flow from producers through consumers.

Phase 1 part 2. The risk of HPAI introduction and transmission along the Ban Klang layer market chain

Spent hens and layer manure disposal pathways are considered higher risk pathways for the introduction and transmission of HPAI than the egg pathway because of the fecal/oral route for transmitting AI virus. The farmers (producers) had the highest risk of contracting the AI virus because of their constant proximity to poultry that related to all three production pathways, while

traders had the highest risk of transmitting the AI virus in the layer market chain because their businesses required movement from farms to farms.

The knowledge, attitude and practice regarding HPAI along the poultry market chain

Approximately 50 percent of respondents had a high level of knowledge regarding AI. Producers had the highest percentage of high-level knowledge, while processors had the highest percentage of a low-level knowledge. The fact that producers had the highest percentage of high-level knowledge may provide an opportunity for efficient intervention. As producers are at the very beginning of the market chain, assuming that good knowledge contributes to good animal health preactices, then the risk of contracting AI for the rest of the actors in the chain will be reduced. Most respondents had positive attitudes towards community participation in an AI surveillance system. Some attitudes towards avian influenza, however, carried a risk for introduction and transmission of the AI virus, as well as some inaccurate beliefs. Over 80 percent of producers and consumers had high scores for positive practice behavior regarding prevention of HPAI, while approximately half of traders (aggregators/market vendors) and 100 percent of the processors had a medium level of positive practice behaviors. The results indicated that the level of practice behavior was not necessarily related to knowledge or attitude level.

Factors associated with KAP toward avian influenza

Five variables (gender, age, educational level, being educated and direct experience regarding AI) were assessed for their effect in relation to both knowledge and attitude among the actors in the layer poultry market chain. The study showed that knowledge, attitude and practice toward AI of each actor in the Ban Klang layer market chain were influenced by different factors. Gender was associated with KAP of producers. There was no association between the

KAP of aggregators and the five variables. Additionally, although the association between knowledge, attitude, and practice regarding AI among the actors in the poultry market chain was found in the study, it was not congruent to the four types of the KAP relationship model by Manoonpeju conclusion (1988). Therefore, the future community-based activities could be adjusted for appropriateness in each participant group by an influenced factor.

Phase 2. Focus discussion group activity (FDG)

In-depth information from traders was taken from two FDG: (1) middlemen and (2) farmers who played both producer and trader roles. The study demonstrated that middlemen are not expected to be involved in the prevention of HPAI at the producer level. The middlemen have not taken action to participate in the offer to implement preventive measures for HPAI. Nevertheless these middlemen play an important role in the poultry market. Furthermore, keystakeholders are critical in conveincing the community on specific procedures to enhance the HPAI control measures. Therefore, these people should be engaged in future planning for HPAI control efforts.

Limitation of the study

1. The attempt to check the reliability of the data by using Cronbach's alpha coefficient method in the questionnaire was not successful due to the small pre-tested sample size that randomly sub-selected from the same population as the study area. Therefore, the data and results must be described with more caution.
2. Potential bias may have occurred in the sampling method where samples were not randomly selected. The sampling techniques used in this study were considered appropriate for the

nature of the participating actors or the only option feasible during the time of the study. The results of this study may not be generalized beyond the study population. Despite the limitation, the researcher attempted to minimize possible selection biases in the study using various selection techniques. For instance, instead of sampling, the entire population of producers in this community was choosen. In addition, a snowballing technique was used to recruit traders/aggregators, which this technique was described elsewhere (Coryn et al. 2007, Hanneman and Riddle 2005, Heckathorn 2002) as appropriate for when it was not possible to identify participants using conventional methods.

3. There was a potential for information bias. To minimize the impact of literacy and to maximize cooperation, face-to-face interviews were carried out. However, being confronted with the interviewers, respondents might be reluctant to respond with the truth of their practice behavior regarding prevention and control of AI. The researcher attemted to crosscheck interviewees' responses with the researcher's own observation when an interview was conducted. While interview biases might also have inheritedly occurred, the biases would be minimal as there is only one interviewer for the entire study.
4. The traders were selected for continued study in phase 2 (FDG) instead of processors for several reasons, including: more frequent movement of their business, large enough sample size, and the proximity of their living area to the study. The study also showed that the processor group showed the highest possibility of introduction and transmission of HPAI along the Ban-Klang layer market chain. Nevertheless, it was not feasible to recruit them in the study.

5. In-depth information was collected from the FDG. However, because there was no way to compare results between pre-test and post-test in this study, these data are useful only for background and future community-based approach studies in this community.

Recommendations

1. In Ban Klang layer market chain, the Ban Klang feedmill is the main supplier of animal feed to all the farms. It is a center place for farmers to buy animal feed and use their own vehicles to transport animal feed from the feedmill to farm. However, the study showed, there were possible risks of transmission the AI virus due to inappropriate biosecurity at this place. For example, there was seldom spraying of disinfectant to vehicles before entering the feedmill area. Also, plastic feed bags were used by several farms without proper disinfection before reusing. Therefore, the biosecurity should be more strict at this place. Possible measures are disinfection of incoming and outgoing vehicles, which can be done by having a disinfectant pond that all vehicle must go through before entering the feedmill area. Risks associated with reusing plastic feed bags can be minimize by using disposable bags or having them disinfected properly before reusing them.
2. Cross-border trade was not a main channel to trade the products from the Ban Klang to Lao PDR. This was due to the inconvenience of transportation by boat across the borders. However, the logistics of transportation and movement of goods and products have been significantly improved between Thai-Lao borders as well as with other countries in the Southeast Asian region. This is evident through the ongoing construction of the bridge connecting between Thailand's Nakhonphanom Province and Lao's Khammouan Province, which would be officially opened in November 2011. It is envisaged that this added

convenience will facilitate trades between the two countries and will inevitably influence patterns of animal and animal product trades. It is thus recommended that ongoing monitoring of value chain, trade patterns, as well as their impacts on transboundary animal diseases risks be carried out to ensure appropriate and timely provisions of animal disease control interventions.

3. The study showed the importance of maintaining awareness of all stakeholders on AI prevention and control. Farmers' vigilance may be depleted over time if there is no perceived risk. It is pertinent to determine appropriate communication campaign to ensure continuing cooperation of relevant stakeholders. While disease control policies are in place, it is also recommended that the effectiveness of such policies is periodically monitored for compliance.
4. Among processor group, several normal operations posed risks of introduction and transmission the HPAI along the Ban Klang layer market chain. Examples of risk behaviors were management by-products with quicklime in reused animal plastic feed bags and kept in their living area, no sewage treatment prior to releasing to public wastewater treatment system. Moreover, the average KAP score of processors was lower than other actors in the study. Therefore, the processors should be more educated about how to prevent the introduction and transmission of AI as their role. Their processing areas should be periodically checked by Nakhon Phanom provincial livestock officers for proper biosecurity as a slaughter house level following Ministerial regulations of slaughter house (MOAC 2012). If the processors do not change or improve their processing area reach to minimal requirement during the given time period, their slaughter house may need to be closed.

5. According to the result of FDG activity, middlemen are not expected to be involved in the prevention of HPAI at the producer level. They did not realize that they were also an important role that possible to introduction and transmission the disease along the layer market chain. Therefore, keystakeholders should be engaged in future planning for HPAI control efforts because they are critical in conveincing the community on specific procedures to enhance the HPAI control measures.
6. From FDG result, key stakeholders were important individuals who influenced the willingness of the community to participate. While some groups naturally resisted participation, these stakeholders positively influenced them so that the community can achieve an effective disease prevention plan. Therefore, the community-based approach will achieve greater success if the key stakeholders are involved at the beginning, such as during construction of the disease control activities.
7. As a study result, no variable was associate to KAP to all actors. Only some variables associated to KAP of some actors. It may because of only 5 variables (gender, age, educational level, being educated and experienced toward AI) were studied, while other variables may have an effect to KAP. Therefore, a further study should include variables such as socioeconomic status and culture which are an important factor in the KAP study. In addition, the community activities should be adjusted appropriately for each participant group by influence factors to achieve surveillance system. For example, activity among male producers will be different from female producers.
8. The association between KAP was not congruent in the four types of the KAP relationship model presented by Manoonpeju conclusion (1988) in this study. For instance, the study revealed that been educating people to have more knowledge and will lead them to have a

better practice behavior may be not followed the theory. This may be related to the type of interview (face to face). Actors may be not truthful in their responses if they know that certain knowledge and practices are not appropriate. Therefore, their responses are mainly to satify the interviewer. Therefore, different approaches would be required in a surveillance system in order to specific critic monitor the practice behavior. Serious actions should be followed if the procedures are not applied.

REFERENCES

Adisasmito WBB. 1995. Sustainable community involvement for controlling Aedes aegypti in Indonesia: potential strategies. Colorado State University.

Akinwumi J, Okike I, Bett B, Randolph TF, Rich KM. 2009. Analyses of the poultry value chain and its linkages and interactions with HPAI risk factors in Nigeria. HPAI Research Brief 16.

Alexander DJ. 2007. An overview of the epidemiology of avian influenza. Vaccine 25: 5637-5644.

Allport R, Mosha R, Bahari M, Swai E, Catley A. 2005. The use of community-based animal health workers to strengthen disease surveillance systems in Tanzania. Revue Scientifique et Technique-Office International des Épizooties 24: 921.

Amonsin A, Choatrakol C, Lapkuntod J, Tantilertcharoen R, Thanawongnuwech R, Suradhat S, Suwannakarn K, Theamboonlers A, Poovorawan Y. 2008. Influenza virus (H5N1) in live bird markets and food markets, Thailand. Emerging infectious diseases 14: 1739.

Atkinson R, Flint J. 2001. Accessing hidden and hard-to-reach populations: Snowball research strategies. Social Research Update 33: 1-4.

Auewarakul P. 2008. The past and present threat of avian influenza in Thailand. Emerging Infections in Asia: 31-44.

Aviaire G. 2010. High Pathogenecity Avain Influenza. Pages 1-17.

Bean B, Moore B, Sterner B, Peterson L, Gerding D, Balfour H. 1982. Survival of influenza viruses on environmental surfaces. Journal of Infectious Diseases 146: 47.

Berhane Y, Hisanaga T, Kehler H, Neufeld J, Manning L, Argue C, Handel K, Hooper-McGrevy K, Jonas M, Robinson J. 2009. Highly pathogenic avian influenza virus A (H7N3) in domestic poultry, Saskatchewan, Canada, 2007. Emerging infectious diseases 15: 1492.

Berg TV. 2009. The role of the legal and illegal trade of live birds and avian products in the spread of avian influenza. . Rev Sci Tech Off Int Epiz. 28: 93-111.

Bloom BS. 1956. Taxonomy of Educational Objectives. Handbook 1: Cognitive Domain. New York: David McKay Co. Inc., l956. pp. 20l-207.

Bloom BS. 1971. Handbook on formative and summative evaluation of student learning.

Chusri D. 2008. A tuberculosis control program formulation, through a community participation approach, in the urban slum Klongtoei community in Bangkok, ThailandChulalongkorn University, Bangkok.

Coryn CLS, Gugiu PC, Davidson EJ, Schröter DC. 2007. Needs assessment in hidden populations using respondent-driven sampling. Evaluation Journal of Australia 7: 3-11.

Corder G. W., Foreman D. I. 2009. *Nonparametric statistics for non- statisticians: a step-by-step approach*. Wiley

Department of Livestock Development (DLD). 2006. "HPAI Control Measures Undertaken since 2004."

Department of Livestock Development (DLD). 2010. Annual report on statistics of livestock population in Thailand. DLD, Bangkok, Thailand.

Department Of Provincial Administration (DOPA). 2011. Population statistics of Nakhon Phanom Province by district and subdistrict in 2011. Available at: http:// stat.bora. dopa.go.th/ xstat/p5348_01.html

Duangjinda M, Choprakarn K, Suwanlee S, Amnueysit P, Thieme O. 2009. Impacts of Avian Influenza outbreaks on indigenous chicken genetic resources in Thailand.

Eagles D, Siregar E, Dung D, Weaver J, Wong F, Daniels P. 2009. H5N1 highly pathogenic avian influenza in Southeast Asia. Revue Scientifique et Technique-Office International des Épizooties 28: 341-348.

Englehardt K. and Lindgren D. 2008. Avian Influenza Behavior Change: Baseline study: Vietnam and Cambodia. Available at: http://avianflu.aed.org/docs/research TNS%20AED% 20Report%20Cambodia%20and%20Vietnam.pdf

Fallon M. 2001. Traceability of poultry and poultry products. Revue scientifique et technique (International Office of Epizootics) 20: 538.

Food and Agricultural Organization of the United Nations (FAO). 2004. Recommendations on the prevention, control and eradication of Highly Pathogenic Avian Influenza in Asia. FAO position paper, September 2004. Rome: FAO, 59 pp.

Food and Agriculture Organization of the United Nations (FAO). 2007. –FAO AIDEnews, Situation Update, 45, 20 February 2007. Available at: ftp://ftp.fao.org/docrep/fao/ 011/ aj087e/aj087e00.pdf.

Food and Agriculture Organization of the United Nations (FAO). 2011. –FAO AIDEnews, Situation Update, 82, 17 November 2011. Available at: http://www.fao.org/docrep/014/ al910e/al910e00.pdf

Food and Agriculture Organization of the United Nations (FAO). 2012. AGA NEWS, FAO studies cross-border trade of poultry commodities to improve risk management of avian influenza in the Greater Mekong Subregion, Updated on: 19 July 2012. Available at: http://www.fao.org/ag/againfo/home/en/ news_archive/2010_trade_of_poultry.html

Forrest HL, Webster RG. 2010. Perspectives on influenza evolution and the role of research. Pages 3-18: Cambridge Univ Press.

Fouchier RAM, Munster V, Wallensten A, Bestebroer TM, Herfst S, Smith D, Rimmelzwaan GF, Olsen B, Osterhaus ADME. 2005. Characterization of a novel influenza A virus hemagglutinin subtype (H16) obtained from black-headed gulls. Journal of virology 79: 2814-2822.

Gilbert M, Chaitaweesub P, Parakamawongsa T, Premashthira S, Tiensin T, Kalpravidh W, Wagner H, Slingenbergh J. 2006. Free-grazing ducks and highly pathogenic avian influenza, Thailand. Emerg Infect Dis 12: 227-234.

Hanneman RA, Riddle M. 2005. Introduction to social network methods: University of California Riverside.

Heckathorn DD. 2002. Respondent-driven sampling II: deriving valid population estimates from chain-referral samples of hidden populations. Social problems 49: 11-34.

Heft-Neal S, Otte J, Pupphavessa W, Roland-Holst D, Sudsawasd S, Zilberman D. 2008. Supply Chain Auditing for Poultry Production in Thailand. Pro-Poor Livestock Policy Initiative, Research Report.

Heft-Neal S., Kahrl F., Otte J., Roland-Holst D. HPAI risk reduction and smallholder poultry supply chains-the case of Thailand. Controlling Avian Flu and Protecting People's Livelihoods in the Mekong Region-HPAI research Brief. 2009;14. Available at: http://www.hpai-research.net /docs /Research_briefs /FAO _2009_HPAI_rbr14.pdf.

Jacoby J, Matell M. S. 1971. Three-point Likert scales are good enough. *Journal of Marketing Research, 8*(4), 495-500.

Jariya W, Kuruchittham V. 2007. Effectiveness of participatory learning program on pesticide utilization among agriculturists in Srinakorn district, Sukhothai province. J Health Res 21: 215-218.

Joan JC. 2009. Snowball Sampling. Retrieved 07 Sep. 2012 from Experiment Resources: http://www.experiment-resources.com/snowball-sampling.html

Kaldi AR. 2005. Study of Relationship between Knowledge, Attitude and Practice of the Elderly with Their General Health in Tehran. Middle East Journal of Age and Ageing 3: 1-6.

Kaliyaperumal K. 2004. Guideline for conducting a knowledge, attitude and practice (KAP) study. AECS Illumination 4: 7-9.

Kasemsuwan S, Poolkhet C, Patanasatienkul T, Buameetoop N, Watanakul M, Chanachai K, Wongsathapornchai K, Métras R, Marcé C, Prakarnkamanant A. 2008. Qualitative risk assessment of the risk of introduction and transmission of H5N1 HPAI virus for 1-km buffer zones surrounding compartmentalised poultry farms in Thailand. ILRI Mekong Team working Paper 7. Report no.

Kothandapani V. 1971. Validation of feeling, belief, and intention to act as three components of attitude and their contribution to prediction of contraceptive behavior. Journal of Personality and Social Psychology 19: 321.

Lin Y, Huang L, Nie S, Liu Z, Yu H, Yan W, Xu Y. 2011. Knowledge, Attitudes and Practices (KAP) related to the Pandemic (H1N1) 2009 among Chinese General Population: a Telephone Survey. BMC infectious diseases 11: 128.

Liu M, He, S., Walker, D., Zhou, N., Perez, D.R., Mo, B., Li, F., Huang, X., Webster, R.G., and Webby, R.G. 2003. The influenza virus gene pool in a poultry market in south central china. . Virology 305: 267-275.

Longman, E. 2003. Longman language activator: Pearson Education.

Manoonpeju N. 1988. Health Education Research 2nd ed. Bangkok: Ungsonbandit. 1988:68

Manuguerra JC, Zientara S, Sailleau C, Rousseaux C, Gicquel B, Rijks I, Van der Werf S. 2000. Evidence for evolutionary stasis and genetic drift by genetic analysis of two equine influenza H3 viruses isolated in France. Veterinary microbiology 74: 59-70.

Maton T. 2006. Development of a Community-based Model to Prevent Avian Influenza in Song Phi Nong District, Suphan Buri Province, ThailandMahidol University.

McLeod A, Morgan, N., Prakash, A., and Hinrichs, J. 2005. Economic and social impact of avian influenza. Rome: Emergency Centre for Transboundary Animal Diseases Operations, Food and Agriculture Organization of the United Nations.

Ministry of Agriculture and Cooperatives (MOAC). 2012. Ministerial regulations of procedures and conditions of slaughter plant and slaughtering in 2012.

Ministry of Public Health (MOPH). 2006. Daily news in Digital Library by Food and Drug Administration. Available at: http://elib.fda.moph.go.th/library/ default.asp?page2 =subde tail&id=4788

NaRanong V. 2008. Structural Changes in Thailand's Poultry Sector: Avian Influenza and Its Aftermath. TDRI Quart Rev 23: 3-10.

Newstrom JW, Davis K. 1986. Human behavior at work: New York. McGraw-Hill.

Nissinen A, Berrios X, Puska P. 2001. Community-based noncommunicable disease interventions: lessons from developed countries for developing ones. BULLETIN-WORLD HEALTH ORGANIZATION 79: 963-970.

Norkaew S. 2009. Knowledge, attitude, and practice(KAP) of using personal protective equipment(PPE) for chilli-growing farmers in Huarua sub-district, Mueang district, Ubonrachathani province, Thailand.

Okobia MN, Bunker CH, Okonofua FE, Osime U. 2006. Knowledge, attitude and practice of Nigerian women towards breast cancer: A cross-sectional study. World journal of surgical oncology 4: 11.

Oskamp S, Schultz PW. 2005. Attitudes and opinions: Lawrence Erlbaum.

PLAN AVE. 2007. Disease Strategy Avian influenza. Plan Avian Influenza – Updated Interim Draft (1,891), 3rd ed., Version 3.1, 2005. http://www.animalhealthaustralia.com.au/aahc)

Praphasiri P, Olsen S, Limprakhanchanarat K, Loasiritavorn Y, Phatanasin S. Knowledge, attitude and practice before and after received information about avian influenza in Nakhon Phanom Province. 2004. Available from: URL: http://www.moph.go.th/

Prakarnkamanant A, Mastin A, Patanasatienkul T, Kasemsuwan S, Wongsathapornchai K, K, Otte J, Pfeiffer D. 2010. HPAI Virus H5N1 Release via Cock Fighting Activities into the 1-km Buffer Zones Surrounding Compartmentalised Broiler Chicken Farms in Thailand.

Puthavathana P, Auewarakul P, Charoenying PC, Sangsiriwut K, Pooruk P, Boonnak K, Khanyok R, Thawachsupa P, Kijphati R, Sawanpanyalert P. 2005. Molecular characterization of the complete genome of human influenza H5N1 virus isolates from Thailand. Journal of General Virology 86: 423-433.

Rushton J, Viscarra R, Bleich EG, McLeod A. 2005. Regional Report. World's Poultry Science Journal 61.

Schwartz NE. 1975. Nutritional knowledge, attitudes, and practices of high school graduates. Journal of the American Dietetic Association 66: 28.

Shahid MA, Abubakar M, Hameed S, Hassan S. 2009. Avian influenza virus (H. Virology journal 6: 38.

Sobsey MD, Meschke JS. 2003. Virus survival in the environment with special attention to survival in sewage droplets and other environmental media of fecal or respiratory origin. Draft 4: 1-87.

Songserm T, Jam-On R, Sae-Heng N, Meemak N. 2006. Survival and stability of HPAI H5N1 in different environments and susceptibility to disinfectants. Pages 254.

Streiner DL, Norman GR. 2008. Health measurement scales: a practical guide to their development and use: Oxford University Press, USA.

Swayne DE, King DJ. 2003. Avian influenza and Newcastle disease. Journal of the American Veterinary Medical Association 222: 1534-1540.

Therawiwat M, Fungladda W, Kaewkungwal J, Imamee N, Steckler A. 2005. Community-based approach for prevention and control of dengue hemorrhagic fever in Kanchanaburi Province, Thailand.

Tiensin T, Chaitaweesub P, Songserm T, Chaisingh A, Hoonsuwan W, Buranathai C, Parakamawongsa T, Premashthira S, Amonsin A, Gilbert M. 2005. Highly pathogenic avian influenza H5N1, Thailand, 2004. Emerg Infect Dis 11: 1664-1672.

Tiensin T, Nielen M, Songserm T, Kalpravidh W, Chaitaweesub P, Amonsin A, Chotiprasatintara S, Chaisingh A, Damrongwatanapokin S, Wongkasemjit S. 2007. Geographic and temporal distribution of highly pathogenic avian influenza A virus (H5N1) in Thailand, 2004-2005: an overview. Avian diseases 51: 182-188.

Triandis HC. 1971. Attitude and attitude change: Wiley New York.

UNHCR. 2008. A Community-based Approach in UHNCR operation. 1st ed. January. Available at : http://www.unhcr.org/refworld/pdfid/47da54722.pdf.

Viseshakul N, Thanawongnuwech R, Amonsin A, Suradhat S, Payungporn S, Keawchareon J, Oraveerakul K, Wongyanin P, Plitkul S, Theamboonlers A. 2004. The genome sequence analysis of H5N1 avian influenza A virus isolated from the outbreak among poultry populations in Thailand. Virology 328: 169-176.

Wang M. DB, Zhou D.H., Zheng B.J, Jing H, Lin YP, Liu YF, Wu XW, Qin PZ, Wang YL, Jian LY, Li XZ, Xu JX, Lu EJ, Li TG, Xu J. 2006. Food markets with live birds as source of avain influenza. Eme Inf Dis 12: 1773-1775.

Webster RG, Yakhno M, Hinshaw VS, Bean WJ, Copal Murti K. 1978. Intestinal influenza: replication and characterization of influenza viruses in ducks. Virology 84: 268-278.

Webster RG. 2004. Wet markets--a continuing source of severe acute respiratory syndrome and influenza? The Lancet 363: 234-236.

Winch PJ, Leontsini E, Rigau-Pérez JG, Ruiz-Pérez M, Clark GG, Gubler DJ. 2002. Community-based dengue prevention programs in Puerto Rico: impact on knowledge, behavior, and residential mosquito infestation. The American journal of tropical medicine and hygiene 67: 363-370.

World Organization for Animal Health (OIE). 2006. Follow-up report No.: 1

Report reference: , OIE Ref: 2929, Report Date: 02/08/2006, Country: Thailand. Available at:http://web.oie.int/wahis/reports/en_fup_ 0000002929_ 20060802_ 121544.pdf

World Health Organization, Regional Office for South-East Asia (WHO SEARO). 2007. Role of village health volunteers in Avian Influenza surveillance in Thailand. New Delhi: 27 pp.

World Health Organization (WHO). 2002. Community participation in local health and sustainable development approach and techniques. European Sustainable Development and Health Series.

World Health Organization (WHO). 2008. A guide to developing knowledge, attitude and practice surveys.

World Health Organization (WHO). 2012. Cumulative Number of Confirmed Human Cases of Avian Influenza A(H5N1) report to WHO, 2003-2012. Available at: http://www.who.int/ influenza/ human_ interface / EN_GIP 20120810CumulativeNumberH5N1cases.pdf

Xiang N, Shi Y, Wu J, Zhang S, Ye M, Peng Z, Zhou L, Zhou H, Liao Q, Huai Y. 2010. Knowledge, attitudes and practices (KAP) relating to avian influenza in urban and rural areas of China. BMC infectious diseases 10: 34.

Yassine HM, Lee CW, Gourapura R, Saif YM. 2010. Interspecies and intraspecies transmission of influenza A viruses: viral, host and environmental factors. Animal Health Research Reviews 11: 53-72.

Yee KS, Carpenter TE, Cardona CJ. 2009. Epidemiology of H5N1 avian influenza. Comparative immunology, microbiology and infectious diseases 32: 325-340.

APPENDIX I

Questionnaire of risk assessment of highly pathogenic Avian Influenza (H5N1) along layer market chain

Questionnaire series for survey about risk of introduction and spread of Avian Influenza (H5N1) in each actor along layer market chain in Ban Klang Sub-district, Nakhon Phanom Meuang District, Nakhon Phanom Province, Thailand.

The questionnaire is constructed specifically for each actor in the market chain. It is divided into three basic parts, including:

1. Interviewing questionnaire for risk assessment of the layer market pathway.
2. Observational questionnaire for risk assessment of the layer market pathway. Only the questionnaire for the producer includes this part.
3. Interviewing questionnaire for Knowledge, Attitude, and Practice survey about Avian Influenza prevention and control measure.

The actors in the market chain include:

1. Producer (layer farmer)
2. Middle Man (collector/trader/market vendor)
3. Processor/Slaughter House
4. Consumer

Questionnaires for each actor in the market chain

Producer Section (layer farmer)

The questionnaire includes all three basic parts.

Part 1. Interviewing questionnaire for producers for risk assessment of the layer market pathway in Ban Klang Sub-district, Nakhon Phanom Meuang District, Nakhon Phanom Province, Thailand.

Instructions: Please mark an "x" in the box □ provided or fill in the blank if applicable.

Part 1.1 Related channels for producers

1. Are you a member of the Ban Klang Layer raiser and feed group?

□ yes □ no, because……

2. What is the source of your animal feed? (can check more than 1)

□ Ban Klang feed group

□ private feed supplier/poultry shop (specifiy)……contact no.……

□ feed mill of company □ Laemthong CO. □ United □ Betagro □ other……

3. Why did you choose that source(s)? (please choose the reason that effect you most)

□ price □ relationship □ contract

□ convenience □ other (specify)……..

4. How do you transport the animal feed from the source to your farm?

□ by your vehicle

□ feed supplier delivers feed

5. What type of vehicle is used to transport the animal feed to your farm?

□ open truck □ closed truck □ motor bicycle

□ tractor □ other (specific)……

6. What do you do with the feed bags when they are empty? (can check more than 1)

□ reuse in Ban Klang feed group

□ reuse to collect layer manure

□ reuse for layer feed within the farm

□ other (specify)…….

7. Do you use the food bags that you reuse in Ban Klang feed group in layer household?

□ yes □ no

8. Do you sell layer manure?

□ yes to……contact no……□ no

If the answer is “no” to question 8, then proceed to question 17.

9. What container do you use to pack layer manure for sale?

□ reuse plastic feed bag from your own farm

□ reuse plastic feed bag from buyer

□ use container (specify)……from your own farm

□ use container (specify)……from buyer

10. What do you charge for one container of layer manure?.....bath/…..(unit)

11. How would you describe the moisture content of the layer manure that you sell?

□ dry □ moist □ wet

12. What is the labor source of packing layer manure to container?

□ one of household labor □ outside labor

13. Does the person who pack layer manure to container be the same person who raise layer?

□ yes □ no

14. Once the manure is purchased, how is it transported to the buyer?

□ farm vehicle transports manure to buyer □ buyer transports the manure from the farm

15. What type of vehicle is used to transport layer manure from the farm to the buyer?

□ open truck □ closed truck □motor bicycle □other (specify)…….

16. How often do you sell layer manure?

□ once a week □ once every two weeks□ once a month □other (specify)……

17. Do you use fertilizer made from layer manure in your farm?

□ yes □ no

18. What is the moisture content of the layer manure that you use to fertilize plants in your farm?

□ dry □ moist □ wet

Part 1.2 Live poultry

	Spent hen	Sick layer/ dead layer	Unhealthy layer
19. What market channels do you use to sell your poultry? (can check more than 1)	□ trader/collector □ retail seller □ processor/slaughter □ consumer	□ trader/collector □ retail seller □ processor/slaughter □ consumer	□ trader/collector □ retail seller □ processor/slaughter □ consumer
20. How many poultry do you sell at one time with that channel?			
21. How do you sell poultry to the buyer?	□ transport to buyer □ buyer transports from farm	□ transport to buyer □ buyer transports from farm	□ transport to buyer □ buyer transports from farm
22. What type of vehicle is used to transport poultry?	□ open truck □ closed truck □ motor bicycle □ other……	□ open truck □ closed truck □ motor bicycle □ other……	□ open truck □ closed truck □ motor bicycle □ other……
23. What type of container is used to package the poultry for the buyer?	□ plastic □ Aluminum □ other…….	□ plastic □ Aluminum □ other…….	□ plastic □ Aluminum □ ther…….

24. How do you manage sick layers or unhealthy layers?

□ separate from flock in a quarantine zone and give supportive treatment; return hens to flock when they recover or look better

□ separate from flock in quarantine zone and give supportive treatment; sell hens when they recover or look better

□ separate from flock in a quarantine zone and sell them as soon as possible

□ separate from flock in a quarantine zone and bury/burning it as soon as possible

25. How do you dispose of a dead layer?

□ consume within household

□ bury in the farm area

□ burn in a poultry incinerator

□ sell to buyer……..(specify)…….

26. What is the source of your farm's water supply?

□ from river □ groundwater □ other (specify)……

27. Has your farm ever passed the layer standards of the Department of Livestock Development?

□ yes, since…… □no, because……

Part 2. Observational questionnaire for producers for risk assessment of the layer market pathway in Ban Klang Sub-district, Nakhon Phanom Meuang District, Nakhon Phanom Province, Thailand.

	Yes/have/do	No/don't have/ don't do	Not sure
1. Are there other poultry farmers in the area?			
2. Do other farmers raise other animals such as dogs or cats in the area?			
3. Does the farm have disinfectant equipment/zone to use on any vehicles before they enter?			
4. Does the farm have a disinfectant container for workers to use before entering the layer house?			
5. Does the farm have a disinfectant zone for dipping egg trays?			
6. Is the disinfectant zone/container/equipment in good working condition?			
7. Do farmers use different egg tray between farm and zone of collected egg?			
8. Is a different egg tray used in the zone for collected eggs and for the buyer?			
9. Does the collected egg zone have any means to prevent eggs from contact with waterfowl?			
10. Does the feed storage area have any means to prevent contact with waterfowl?			
11. Do the layer houses have nets to prevent the vector of HPAI from entering the house?			
12. Do workers use masks and gloves when they work with the layers?			
13. Do workers wash their hands before leaving work?			
14. Are the eggs washed/cleaned before they are sold?			
15. After workers finish washing/cleaning the eggs, do they wash their hands?			
16. Does the farm have a separate zone for sick layers or unhealthy layers?			
17. Does the farm have a poultry incinerator?			
18. Does sewage from farm contaminate the community water supply?			

Part 3. Interviewing questionnaire for producers for Knowledge, Attitude and Practice survey about Avian Influenza prevention and control in layer farms in Tambon Ban Klang, Nakhon Phanom Meuang District, Nakhon Phanom Province, Thailand.

Background:

1. Have you ever attended, been trained or participated in activity that educated about Avian Influenza?

□ yes when…….by……..

□ no

2. Have you ever had direct experience with Avian Influenza?

□ yes from

□ your animals were suspected to infect/infected Avian Influenza

□ a household member(s) was suspected to be infected with Avian Influenza

□ no

Part 3.1 Knowledge

1. What is the causative agent of Avian Influenza?

□ virus □ bacteria □ parasite □ don't know

2. What animals can be infected with Avian Influenza?(can check more than 1)

□ only chickens □ poultry □ mammals □ don't know

3. What are the major signs and symptoms in poultry infected with High Pathogenic Avian Influenza (HPAI)?

□ depressed, greenish and swollen wattle and comb, swelling in the neck and feet, anorexia, cough, sneezing, diarrhea, sudden death without clinical signs

□ depressed, greenish watery diarrhea, sneezing, swelling around the eyes and neck

□ don't know

4. Are there methods to treat poultry infected with HPAI?

□ yes □ no □ don't know

5.How is HPAI transmitted between animals? (can check more than 1)

□ direct contact with infected bird or animal

□ direct contact with dead chickens and eating uncooked meat from dead chickens

□ contact with secretions from infected animals or birds such as feces, saliva, mucus and tears.

□contact with equipment such as cages, egg trays or vehicles that have been contaminated with secretions from infected animals or birds

□ don't know

6. Can HPAI be transmitted to eggs?

□ yes □ no □ don't know

7. Can HPAI be transmitted from animals or birds to humans?

□ yes □ no □ don't know

8. Can HPAI be transmitted from person to person?

□ yes because……□ no because……

□ don't know

9. How are humans infected with HPAI?

□ direct contact with infected birds or animals

□ direct contact with dead chickens or eating uncooked meat from dead chickens

□ contact with secretions from infected animals or birds such as feces, saliva, mucus and tears.

□contact with equipment such as cages, egg trays or vehicles contaminated with secretions from infected animals or birds

□ don't know

10. What signs and symptoms are seen in people suspected to have HPAI infection?

□ high fever, headache, cough, sneezing, sore throat, muscle aches, difficult breathing

□ jaundice, anorexia, weakness and depression

□ don't know

11. Which behavior carries a high risk for transmitting HPAI to humans?

□ eating uncooked meat from sick chickens

□ eating uncooked eggs

□ both

□ don't know

12. How much important is HPAI to the farming community?

□ the high mortality rate affects only chickens

□ the high mortality rate affects all poultry

□ there is a high mortality rate in poultry and other animals, but not humans, can be infected

□ there is a high mortality rate in poultry, and both animals and humans can be infected

13. In an area contaminated with Avian Influenza, who is most susceptible to acquiring an infection?

□ children □ adults □elderly □ children and elderly

14. What actor in the poultry market chain has the greatest risk of infection and transmitting HPAI? (can check more than 1)

□ farmer □ trader/collector/market vendor

□ business that deals with live chickens □ business that deals with poultry products

□ consumer □etc (specify)……

Part 3.2 Attitude

	Agree/satisfied	Do not agree/ not satisfied	Not sure
15. Avian Influenza is a preventable disease			
16. Infected chickens cannot be treated			
17. Infected people cannot be treated			
18. Avian Influenza is a harmful disease because it can mutate and cause severe outbreaks among humans			
19. Waterfowl are a reservoir for Avian Influenza			
20. Infected animals can shed Avian Influenza virus, although they don't show clinical signs			
21. Direct contact with sick chickens increases the risk of Avian Influenza infection			
22. Eating uncooked meat from sick chickens increases the risk of Avian Influenza infection			
23. Eating uncooked eggs from a contaminated area increases the risk of Avian Influenza infection			
24. Using the same vehicle to transport poultry and humans increases the risk of Avian Influenza infection			
25. Contaminated equipment, cages, plastic feed bags, boots, clothes can spread Avian Influenza			
26. Infected animals can shed Avian Influenza especially in secretions such as feces, saliva, mucus and blood			
27. People who work with poultry or poultry products have a greater risk for becoming infected with Avian Influenza			
28. If people in poultry-related jobs have clinical signs of high fever, shivering, sore throat, or difficult breathing, they should see a doctor as soon as possible			
29. Using a disinfectant or soap to clean equipment, cages, clothes, etc. can prevent infections/spread of Avian Influenza			
30. Your group has a greater risk of HPAI infection			
31. What do you think of a policy to destroy all poultry within 5 km of an infected area?			
32. What do you think of a policy to destroy poultry only within the infected area, to increase surveillance and test for the disease in the surrounding area?			
33. If your chickens die suddenly or get sick from an unknown cause over the course of more than one day, you must inform the Livestock Officer			
34. What do you think about compensation money from the government if your chickens have to be destroyed?			
35. Do you think this area is at risk for HPAI to reoccur?			
36. Do you think this area should have a good surveillance system involving community			

participation in order to prevent reoccurrence of HPAI?			

Part 3.3 Practices

	At all times	Sometimes	No
37. Do you raise other poultry on your farm?			
38. Do you raise other animals such as dogs or cats on your farm?			
39. Do you properly protect yourself before contacting sick or dead chickens by wearing personal protection equipment such as a mask, gloves, an apron and boots?			
40. When you finish your work, do you wash your hands and any equipment used with the chickens?			
41. Do you use soap or disinfectant to clean your hands and equipment?			
42. Do you use disinfectant to dip/wash any egg trays that you get from the outside?			
43. Do you dip your boots in disinfectant before entering the layer house?			
44. Do you spray disinfectant on vehicles before they enter your farm?			
45. Do you separate egg trays inside the farm from those that come from the outside?			
46. Do you ask for permission of movement Day Old Chick from DLD before replace it in your farm?			
47. If household member had flu-like symptoms, would you seek the help of a physician right away?			
48. Do your workers who handle the poultry or poultry products have a heath check every year?			
49. If sudden unexplained deaths occur among your chickens over more than one day, do you report it to the livestock officer?			

Middleman Section (collectors/traders/market vendors)

Questionnaire includes two interviews, one for risk assessment and one for the Knowledge, Attitude and Practice survey

Part 1. Interviewing questionnaire for middle men for risk assessment of the layer market pathway in Tambon Ban Klang, Nakhon Phanom Meuang District, Nakhon Phanom Province, Thailand.

1. What type of poultry products do you buy? (can check more than 1)

□ eggs □ live chickens □ layer manure □ other (specify)……

2. Products from how many farms are usually included in one load?

□ 1 □ 2-3 □ more than 4

3. What type of vehicle is used to transport those products from the farm?

□ open truck □ closed truck □ motor bicycle

□ tractor □ other (specify)……

4. What is your reason for buying the products from that source? (please choose the reason that effect you most)

□ price □ relationship □ contract

□ convenience □ other (specify)……..

5. Do you use same vehicle that transports chickens to transport other poultry?

□ yes □ no

6. Do you use same vehicle that transports poultry to transport people?

□ yes □ no

7. How do you sell your products?

□ sell to retail seller……. □ sell to market vendor……□ sell to consumer

□ sell to processor…….□ other (specify)…….

8. Where do you sell your products?

……

……

9. Do you use your own packaging such as egg trays or cages?

□ yes □ no

10. What is the packaging material?

□ plastic □ metal/aluminum □wood □ other (specify)……

Part 2. Interviewing questionnaire for middle men for the KAP survey about Avian Influenza prevention and control in Tambon Ban Klang, Nakhon Phanom Meuang District, Nakhon Phanom Province, Thailand.

Background:

1. Have you ever attended, been trained or participated in activity that educated about Avian Influenza?

□ yes when…….by……..

□ no

2. Have you ever had direct experience with Avian Influenza?

□ yes from

□ your animals were suspected to infect/infected Avian Influenza

□ a household member(s) was suspected to be infected with Avian Influenza

□ no

Part 2.1 Knowledge

1. What is the causative agent of Avian Influenza?

□ virus □ bacteria □ parasite □ don't know

2. What animals can be infected with Avian Influenza?(can check more than 1)

□ only chickens □ poultry □ mammals □ don't know

3. What are the major signs and symptoms in poultry infected with High Pathogenic Avian Influenza (HPAI)?

□ depressed, greenish and swollen wattle and comb, swelling in the neck and feet, anorexia, cough, sneezing, diarrhea, sudden death without clinical signs

□ depressed, greenish watery diarrhea, sneezing, swelling around the eyes and neck

□ don’t know

4. Are there methods to treat poultry infected with HPAI?

□ yes □ no □ don’t know

5. How is HPAI transmitted between animals? (can check more than 1)

□ direct contact with infected bird or animal

□ direct contact with dead chickens and eating uncooked meat from dead chickens

□ contact with secretions from infected animals or birds such as feces, saliva, mucus and tears.

□contact with equipment such as cages, egg trays or vehicles that have been contaminated with secretions from infected animals or birds

□ don’t know

6. Can HPAI be transmitted to eggs?

□ yes □ no □ don’t know

7. Can HPAI be transmitted from animals or birds to humans?

□ yes □ no □ don’t know

8. Can HPAI be transmitted from person to person?

□ yes because……. □ no because……

□ don’t know

9. How are humans infected with HPAI?

□ direct contact with infected birds or animals

□ direct contact with dead chickens or eating uncooked meat from dead chickens

□ contact with secretions from infected animals or birds such as feces, saliva, mucus and tears.

□contact with equipment such as cages, egg trays or vehicles contaminated with secretions from infected animals or birds

□ don't know

10. What signs and symptoms are seen in people suspected to have HPAI infection?

□ high fever, headache, cough, sneezing, sore throat, muscle aches, difficult breathing

□ jaundice, anorexia, weakness and depression

□ don't know

11. Which behavior carries a high risk for transmitting HPAI to humans?

□ eating uncooked meat from sick chickens □ eating uncooked eggs

□ both □ don't know

12. How much important is HPAI to the farming community?

□ the high mortality rate affects only chickens

□ the high mortality rate affects all poultry

□ there is a high mortality rate in poultry and other animals, but not humans, can be infected

□ there is a high mortality rate in poultry, and both animals and humans can be infected

13. In an area contaminated with Avian Influenza, who is most susceptible to acquiring an infection?

□ children □ adults □elderly □ children and elderly

14. What actor in the poultry market chain has the greatest risk of infection and transmitting HPAI? (can check more than 1)

□ farmer □ trader/collector/market vendor

□ business that deals with live chickens □ business that deals with poultry products

□ consumer □ etc (specify)……

Part 2.2 Attitude

	Agree/ satisfied	Do not agree/ not satisfied	Not sure
15. Avian Influenza is a preventable disease			
16. Infected chickens cannot be treated			
17. Infected people cannot be treated			
18. Avian Influenza is a harmful disease because it can mutate and cause severe outbreaks among humans			
19. Waterfowl are a reservoir for Avian Influenza			
20. Infected animals can shed Avian Influenza virus, although they don't show clinical signs			
21. Direct contact with sick chickens increases the risk of Avian Influenza infection			
22. Eating uncooked meat from sick chickens increases the risk of Avian Influenza infection			
23. Eating uncooked eggs from a contaminated area increases the risk of Avian Influenza infection			
24. Using the same vehicle to transport poultry and humans increases the risk of Avian Influenza infection			
25. Contaminated equipment, cages, plastic feed bags, boots, clothes can spread Avian Influenza			
26. Infected animals can shed Avian Influenza especially in secretions such as feces, saliva, mucus and blood			
27. People who work with poultry or poultry products have a greater risk for becoming infected with Avian Influenza			
28. If people in poultry-related jobs have clinical signs of high fever, shivering, sore throat, or difficult breathing, they should see a doctor as soon as possible			
29. Using a disinfectant or soap to clean equipment, cages, clothes, etc. can prevent infections/spread of Avian Influenza			
30. Your group has a greater risk of HPAI infection			
31. What do you think of a policy to destroy all poultry within 5 km of an infected area?			
32. What do you think of your group plays important role to prevent spread of the disease?			
33. What do you think of law of animal movement?			
34. What do you think of policy to quarantine poultry product when the outbreak of HPAI occur?			
35. What do you think of a policy to destroy poultry only within the infected area, to increase surveillance and test for the disease in the surrounding area?			
36. If your chickens die suddenly or get sick from an unknown cause over the course of more than one day, you must inform the Livestock Officer			
37. What do you think about compensation money from the government if your chickens have to be destroyed?			
38. Do you think this area is at risk for HPAI to reoccur?			
39. Do you think this area should have a good surveillance system involving community participation in order to prevent reoccurrence of HPAI?			

Part 2.3 Practice

	At all times	Sometimes	No
Please skip to 46 if you do not trade spent hens. 40. Do you properly protect yourself before contacting sick or dead chickens by wearing personal protection equipment such as a mask, gloves, an apron and boots?			
41. When you finish your work, do you wash your hands and any equipment used with the chickens?			
42. Do you use soap or disinfectant to clean your hands and equipment?			
43. Do you use same vehicle to transport chicken and other poultry?			
44. Do you use same vehicle to transport poultry and human?			
45. If sudden unexplained deaths occur among your chickens during transportation, do you report it to the livestock officer?			
46. Do you dip/wash egg trays with disinfectant before reuse it?			
47. Do you spray disinfectant on vehicles before they enter your farm?			
48. Do you separate egg trays inside the farm from those that come from the outside?			
49. Do you use your own packaging such as egg trays,cage?			
50. Do you return poultry product to seller if you can't sell all of them?			
51. If household member had flu-like symptoms, would you seek the help of a physician right away?			
52. Do your workers who handle the poultry or poultry products have a heath check every year?			

Processing Section (processor/slaughter house1

Questionnaire includes two interviews, one for risk assessment and one for the KAP survey

Part 1. Interviewing questionnaire for processors for risk assessment of the layer market pathway in Tambon Ban Klang, Nakhon Phanom Meuang District, Nakhon Phanom Province, Thailand.

1. What kind of poultry do you process? (can check more than 1)

□ spent hens □ sick chickens □unhealthy chickens □ other……

2. What type(s) of poultry products do you buy? (can check more than 1)

□ live poultry □ dead poultry □ carcasses

3. What source do you use for these products? (can check more than 1)

□ farm ……. □ middle man…… □other (specify)……..

4. What is your reason for choosing that source? (please choose the reason that effect you most)

□ price □ relationship □ contract

□ convenience □ other (specify)……..

5. How many poultry do you usually buy at one time from that source? .....

6. How is your purchase delivered to your location?

□ transported by farm owner…….

□ transported by middle man……

□ you transport the poultry from the farm to your location

□other (specify)……

7. Do you use your own packaging (such as cages) when you buy chickens from that source?

□ yes □ no

8. What is the packaging material?

□ plastic □ metal/aluminum □wood □ other (specify)……

9. Where do you sell your processed poultry?

□ direct to consumer □ sell to market vendor □ sell to trader□ other (specify)……

10. How many processed poultry do you usually sell at one time to the buyer?.....

11. What is the source of the water supply for your processing area?

□ from river □ groundwater □ other (specify)……

12. How do you manage the sewage? .....

13. How do you manage by-products such as carcasses? .....

Part 2. Interviewing questionnaire for processors for the KAP survey about Avian Influenza prevention and control in Tambon Ban Klang, Nakhon Phanom Meuang District, Nakhon Phanom Province, Thailand.

Background:

1. Have you ever attended, been trained or participated in activity that educated about Avian Influenza?

□ yes when……by……

□ no

2. Have you ever had direct experience with Avian Influenza?

□ yes from

□ your animals were suspected to infect/infected Avian Influenza

□ a household member(s) was suspected to be infected with Avian Influenza

□ no

Part 2.1 Knowledge

1. What is the causative agent of Avian Influenza?

□ virus □ bacteria □ parasite □ don't know

2. What animals can be infected with Avian Influenza?(can check more than 1)

□ only chickens □ poultry □ mammals □ don't know

3. What are the major signs and symptoms in poultry infected with High Pathogenic Avian Influenza (HPAI)?

□ depressed, greenish and swollen wattle and comb, swelling in the neck and feet, anorexia, cough, sneezing, diarrhea, sudden death without clinical signs

□ depressed, greenish watery diarrhea, sneezing, swelling around the eyes and neck

□ don't know

4. Are there methods to treat poultry infected with HPAI?

□ yes □ no □ don't know

5. How is HPAI transmitted between animals? (can check more than 1)

□ direct contact with infected bird or animal

□ direct contact with dead chickens and eating uncooked meat from dead chickens

□ contact with secretions from infected animals or birds such as feces, saliva, mucus and tears.

□contact with equipment such as cages, egg trays or vehicles that have been contaminated with secretions from infected animals or birds

□ don't know

6. Can HPAI be transmitted to eggs?

□ yes □ no □ don't know

7. Can HPAI be transmitted from animals or birds to humans?

□ yes □ no □ don't know

8. Can HPAI be transmitted from person to person?

□ yes because…… □ no because……

□ don't know

9. How are humans infected with HPAI?

□ direct contact with infected birds or animals

□ direct contact with dead chickens or eating uncooked meat from dead chickens

□ contact with secretions from infected animals or birds such as feces, saliva, mucus and tears.

□contact with equipment such as cages, egg trays or vehicles contaminated with secretions from infected animals or birds

□ don't know

10. What signs and symptoms are seen in people suspected to have HPAI infection?

□ high fever, headache, cough, sneezing, sore throat, muscle aches, difficult breathing

□ jaundice, anorexia, weakness and depression

□ don't know

11. Which behavior carries a high risk for transmitting HPAI to humans?

□ eating uncooked meat from sick chickens

□ eating uncooked eggs

□ both

□ don't know

12. How much important is HPAI to the farming community?

□ the high mortality rate affects only chickens

□ the high mortality rate affects all poultry

□ there is a high mortality rate in poultry and other animals, but not humans, can be infected

□ there is a high mortality rate in poultry, and both animals and humans can be infected

13. In an area contaminated with Avian Influenza, who is most susceptible to acquiring an infection?

□ children □ adults □elderly □ children and elderly

14. What actor in the poultry market chain has the greatest risk of infection and transmitting HPAI? (can check more than 1)

□ farmer □ trader/collector/market vendor

□ business that deals with live chickens □ business that deals with poultry products

□ consumer □etc (specify)……

Part 2.2 Attitude

	Agree/satisfied	Do not agree/ not satisfied	Not sure
15. Avian Influenza is a preventable disease			
16. Infected chickens cannot be treated			
17. Infected people cannot be treated			
18. Avian Influenza is a harmful disease because it can mutate and cause severe outbreaks among humans			
19. Waterfowl are a reservoir for Avian Influenza			
20. Infected animals can shed Avian Influenza virus, although they don't show clinical signs			
21. Direct contact with sick chickens increases the risk of Avian Influenza infection			
22. Eating uncooked meat from sick chickens increases the risk of Avian Influenza infection			
23. Eating uncooked eggs from a contaminated area increases the risk of Avian Influenza infection			
24. Using the same vehicle to transport poultry and humans increases the risk of Avian Influenza infection			
25. Contaminated equipment, cages, plastic feed bags, boots, clothes can spread Avian Influenza			
26. Infected animals can shed Avian Influenza especially in secretions such as feces, saliva, mucus and blood			
27. People who work with poultry or poultry products have a greater risk for becoming infected with Avian Influenza			
28. If people in poultry-related jobs have clinical signs of high fever, shivering, sore throat, or difficult breathing, they should see a doctor as soon as possible			
29. Using a disinfectant or soap to clean equipment, cages, clothes, etc. can prevent infections/spread of Avian Influenza			
30. Your group has a greater risk of HPAI infection			
31. What do you think of your group plays important role to prevent spread of the disease?			
32. What do you think of law of biosecurity of slaughter house?			
33. What do you think of slaughter house should be located away from community?			
34. What do you think of policy to quarantine poultry product when the outbreak of HPAI occur?			
35. Do you think this area is at risk for HPAI to reoccur?			

36. Do you think this area should have a good surveillance system involving community participation in order to prevent reoccurrence of HPAI?			

Part 2.3 Practice

	At all times	Sometimes	No
37. Do you properly protect yourself before contacting sick or dead chickens by wearing personal protection equipment such as a mask, gloves, an apron and boots?			
38. When you finish your work, do you wash your hands and any equipment used with the chickens?			
39. Do you use soap or disinfectant to clean your hands and equipment?			
40. Do you spray disinfectant on vehicles before they go out from processing area?			
41. Do you use your own packaging such as cage?			
42. Do you check your standard of processing level of DLD?			
43. Do you use same vehicle to transport chicken and other poultry?			
44. Do you use same vehicle to transport poultry and human?			
45. If household member had flu-like symptoms, would you seek the help of a physician right away?			
46. Do you return poultry product to seller if you can't sell all of them?			
47. Do your workers who process the poultry have a heath check every year?			
48. If sudden unexplained deaths occur among your chickens during transportation, do you report it to the livestock officer?			

Consumer Section

Questionnaire includes two parts, one for risk assessment and the other for the KAP survey

Part 1. Interviewing questionnaire for consumers for risk assessment of the layer market pathway in Tambon Ban Klang, Nakhon Phanom Meuang District, Nakhon Phanom Province, Thailand.

1. What type(s) of poultry products do you buy? (can check more than 1)

□ live poultry □ dead poultry □ processed poultry □ carcasses □ eggs

2. From what source do you purchase these products? (can answer more than 1)

□ farm …….. □ middle man……

□ processing house…….. □ market……

□ other (specify)……..

3. What is your reason for choosing that source? (please choose the reason that effect you most)

□ price □ relationship □ convenience □ other (specify)……

4. How many poultry do you usually buy at one time from that source? .....

5. How does your purchase get from that source to you?

□ transported by farm owner……□ transported by middleman……

□ transported by processor…… □ you transport it from……

□ other (specific)……...

6. Do you use your own packaging (such as cages) when you buy chickens from that source?

□ yes □ no

7. What is the packaging material?

□ plastic □ metal/aluminum □wood □ other (specify)……

8. If you buy live chickens for consumption, do you process them yourself?

□ yes □ no……

9. If you process chickens yourself, how do you dispose of the carcasses?

□ bury □ burning □ feed to animals

□ throw in garbage □ other (specify)…….

10. If you process chicken yourself, what is the source of the water supply in your processing area?

□ from river □ groundwater □ other (specify)……

Part 2. Interviewing questionnaire for consumers for the KAP survey about Avian Influenza prevention and control in Tambon Ban Klang, Nakhon Phanom Meuang District, Nakhon Phanom Province, Thailand.

Background:

1. Have you ever attended, been trained or participated in activity that educated about Avian Influenza?

□ yes when…….by…….

□ no

2. Have you ever had direct experience with Avian Influenza?

□ yes from

□ your animals were suspected to infect/infected Avian Influenza

□ a household member(s) was suspected to be infected with Avian Influenza

□ no

Part 2.1 Knowledge

1. What is the causative agent of Avian Influenza?

□ virus □ bacteria □ parasite □ don't know

2. What animals can be infected with Avian Influenza?(can check more than 1)

□ only chickens □ poultry □ mammals □ don't know

3. What are the major signs and symptoms in poultry infected with High Pathogenic Avian Influenza (HPAI)?

□ depressed, greenish and swollen wattle and comb, swelling in the neck and feet, anorexia, cough, sneezing, diarrhea, sudden death without clinical signs

□ depressed, greenish watery diarrhea, sneezing, swelling around the eyes and neck

□ don't know

4. Are there methods to treat poultry infected with HPAI?

□ yes □ no □ don't know

5. How is HPAI transmitted between animals? (can check more than 1)

□ direct contact with infected bird or animal

□ direct contact with dead chickens and eating uncooked meat from dead chickens

□ contact with secretions from infected animals or birds such as feces, saliva, mucus and tears.

□contact with equipment such as cages, egg trays or vehicles that have been contaminated with secretions from infected animals or birds

□ don't know

6. Can HPAI be transmitted to eggs?

□ yes □ no □ don't know

7. Can HPAI be transmitted from animals or birds to humans?

□ yes □ no □ don't know

8. Can HPAI be transmitted from person to person?

□ yes because…… □ no because…… □ don't know

9. How are humans infected with HPAI?

□ direct contact with infected birds or animals

□ direct contact with dead chickens or eating uncooked meat from dead chickens

□ contact with secretions from infected animals or birds such as feces, saliva, mucus and tears.

□contact with equipment such as cages, egg trays or vehicles contaminated with secretions from infected animals or birds

□ don’t know

10. What signs and symptoms are seen in people suspected to have HPAI infection?

□ high fever, headache, cough, sneezing, sore throat, muscle aches, difficult breathing

□ jaundice, anorexia, weakness and depression

□ don’t know

11. Which behavior carries a high risk for transmitting HPAI to humans?

□ eating uncooked meat from sick chickens

□ eating uncooked eggs

□ both

□ don’t know

12. How much important is HPAI to the farming community?

□ the high mortality rate affects only chickens

□ the high mortality rate affects all poultry

□ there is a high mortality rate in poultry and other animals, but not humans, can be infected

□ there is a high mortality rate in poultry, and both animals and humans can be infected

13. In an area contaminated with Avian Influenza, who is most susceptible to acquiring an infection?

□ children □ adults □elderly □ children and elderly

14. What actor in the poultry market chain has the greatest risk of infection and transmitting HPAI? (can check more than 1)

□ farmer □ trader/collector/market vendor

□ business that deals with live chickens □ business that deals with poultry products

□ consumer □etc (specify)……

Part 2.2 Attitude

	Agree/satisfied	Do not agree/ not satisfied	Not sure
15. Avian Influenza is a preventable disease			
16. Infected chickens cannot be treated			
17. Infected people cannot be treated			
18. Avian Influenza is a harmful disease because it can mutate and cause severe outbreaks among humans			
19. Waterfowl are a reservoir for Avian Influenza			
20. Infected animals can shed Avian Influenza virus, although they don't show clinical signs			
21. Direct contact with sick chickens increases the risk of Avian Influenza infection			
22. Eating uncooked meat from sick chickens increases the risk of Avian Influenza infection			
23. Eating uncooked eggs from a contaminated area increases the risk of Avian Influenza infection			
24. Using the same vehicle to transport poultry and humans increases the risk of Avian Influenza infection			
25. Contaminated equipment, cages, plastic feed bags, boots, clothes can spread Avian Influenza			
26. Infected animals can shed Avian Influenza especially in secretions such as feces, saliva, mucus and blood			
27. People who work with poultry or poultry products have a greater risk for becoming infected with Avian Influenza			
28. If household member have clinical signs of high fever, shivering, sore throat, or difficult breathing, they should see a doctor as soon as possible			
29. Using a disinfectant or soap to clean equipment, cages, clothes, etc. can prevent infections/spread of Avian Influenza			
30. Your group has a greater risk of HPAI infection			
31. If live chicken that you buy from seller have suspected symptom of HPAI, you must inform Livestock officer			
32. Do you think this area is at risk for HPAI to reoccur?			
33. Do you think this area should have a good surveillance system involving community participation in order to prevent reoccurrence of HPAI?			

Part 2.3 Practice

	At all times	Sometimes	No
** if you do not slaughter chicken by yourself, please skip to 37** 34. Do you properly protect yourself before contacting sick or dead chickens by wearing personal protection equipment such as a mask, gloves, an apron and boots?			
35. When you finish your work, do you wash your hands and any equipment used with the chickens?			
36. Do you use soap or disinfectant to clean your hands and equipment?			
37. Do you eat cooked chicken and cooked egg?			
38. If household member had flu-like symptoms, would you seek the help of a physician right away?			
39. Do you report to livestock officer when you see suspect H5N1 chicken?			

แบบสอบถามการประเมินความเสี่ยงของเชื้อไข้หวัดนกชนิดรุนแรง (H5N1) ในเส้นทางการตลาดไก่ไข่

ชุดแบบสอบถามเพื่อการสำรวจหาความเสี่ยงของการเกิดและแพร่กระจายของโรคไข้หวัดนกชนิดรุนแรง(H5N1)ของแต่ละบทบาทในเส้นทางการตลาดไก่ไข่ ณ ตำบล บ้านกลาง อำเภอ เมืองนม ประเทศไทยนครพนม จังหวัด นครพ

เนื้อหาของแบบสอบถามจะขึ้นกับลักษณะของแต่ละบทบาทในเส้นทางการตลาดไก่ไข่ โดยแบบสอบถามจะประกอบไปด้วยเนื้อหาหลัก 3 ส่วนดังนี้

1. แบบสัมภาษณ์ เพื่อการประเมินความเสี่ยงของโรคไข้หวัดนกในเส้นทางการตลาดไก่ไข่
2. แบบสังเกต เพื่อการประเมินความเสี่ยงของโรคไข้หวัดนกในเส้นทางการตลาดไก่ไข่ โดยเนื้อหาส่วนนี้จะมีเฉพาะในบทบาทผู้ผลิต
3. แบบสัมภาษณ์ เพื่อ สำรวจความรู้ ทัศนคติ และการปฏิบัติตนที่เกี่ยวข้องกับการป้องกันและควบคุมโรคไข้หวัดนก

โดย บทบาทในเส้นทางการตลาดไก่ไข่ ประกอบด้วย

1. บทบาทผู้ผลิต (เกษตรกรผู้เลี้ยงไก่ไข่)
2. บทบาทพ่อค้าคนกลาง (แม่ค้าในตลาด/พ่อค้าขายส่ง/ผู้รวบรวมสินค้า)
3. บทบาทผู้ค้าชำแหละ/โรงเชือด
4. บทบาทผู้บริโภค

แบบสอบถามของแต่ละบทบาทในเส้นทางการตลาด

บทบาทผู้ผลิต (เกษตรกรผู้เลี้ยงไก่ไข่)

แบบสอบถามจะประกอบไปด้วยทั้งเนื้อหาหลัก 3 ส่วน

ส่วนที่ 1 แบบสัมภาษณ์ผู้ผลิต เพื่อ การประเมินความเสี่ยงของโรคไข้หวัดนกในเส้นทางการตลาดไก่ไข่ ณ ตำบล บ้านกลาง อำเภอ เมืองนครพนม จังหวัด นครพนม ประเทศไทย

คำอธิบาย : โปรดกากบาท X ลงในช่อง □ หน้าคำตอบที่เลือก หรือ เติมข้อมูลลงในช่องว่างที่เว้นไว้

ส่วนที่ 1 บทบาทผู้ผลิตในช่องทางการตลาดที่เกี่ยวข้อง

1. ท่านเป็นสมาชิกของกลุ่มผู้เลี้ยงไก่ไข่บ้านกลาง และ โรงอาหารสัตว์สำหรับกลุ่มผู้เลี้ยงไก่ไข่บ้านกลางหรือไม่

   □ ใช่ □ไม่ใช่ เพราะ……

2. ที่มาของแหล่งวัตถุดิบที่ท่านใช้ในการเลี้ยงไก่ไข่ (สามารถตอบได้มากกว่า 1 คำตอบ)

   □ โรงอาหารสัตว์สำหรับกลุ่มผู้เลี้ยงไก่ไข่บ้านกลาง

   □ จากร้านค้าอาหารสัตว์อิสระ .....หมายเลขติดต่อ.....(โปรดระบุ)

   □ โรงอาหารสัตว์ของบริษัท □ แหลมทอง □ ยูไนเต็ด □ เบทาโกร □ อื่นๆ (ระบุ)…

3. เหตุผลใดที่ท่านเลือกซื้ออาหารสัตว์จากแหล่งนั้นๆ (เลือกตอบเหตุผลที่มีอิทธิพลต่อท่านมากที่สุด)

   □ ราคา □ ความสนิทสนม □ เงื่อนไขสัญญา

   □ ความสะดวก □ อื่นๆ (ระบุ)……..

4. อาหารสัตว์จากแหล่งนั้นๆ ขนส่งมายังฟาร์มของท่านได้อย่างไร?

□ โดย ยานพาหนะของท่านเอง □ โดย ยานพาหนะจากแหล่งขายอาหารสัตว์นั้นๆ

5. ยานพาหนะประเภทใดที่ใช้ในการขนส่งอาหารสัตว์จากแหล่งอาหารสัตว์นั้นๆมายังฟาร์มของท่าน?

□ รถกระบะเปิดท้าย □ รถกระบะปิดท้าย □ รถจักรยานยนต์

□ รถแทรกเตอร์ □ อื่นๆ (ระบุ).....

6. ท่านมีวิธีการจัดการอย่างไรกับถุงบรรจุอาหารสัตว์ที่ใช้แล้ว? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ นำมาใช้ซ้ำ เพื่อบรรจุอาหารสัตว์ภายในกลุ่มอาหารสัตว์บ้านกลาง

□ นำมาใช้ซ้ำ เพื่อบรรจุมูลไก่

□ นำมาใช้ซ้ำ เพื่อบรรจุอาหารสัตว์ใช้ภายในฟาร์ม

□ อื่นๆ .... (ระบุ)..... .....

7. ถุงอาหารสัตว์ที่ได้มีการนำไปใช้ซ้ำในโรงอาหารสัตว์สำหรับกลุ่มผู้เลี้ยงไก่ไข่บ้านกลาง ท่านได้มีการนำไปใส่อาหารใช้ในภายเล้าไก่ หรือไม่

□ ใช่ □ ไม่ใช่

8. ท่านได้มีการขายมูลไก่ หรือไม่?

□ ขาย ให้แก่ (ชื่อผู้รับซื้อ).....หมายเลขติดต่อ .....

□ ไม่ได้ขาย (ข้ามไปยังคำถามข้อ 17)

9. ท่านใช้ภาชนะชนิดใด จากแหล่งใด ในการบรรจุมูลไก่เพื่อการจำหน่าย?

□ ถุงพลาสติกบรรจุอาหารสัตว์ที่ใช้แล้วจากภายในฟาร์มของท่าน

□ ถุงพลาสติกบรรจุอาหารสัตว์ที่ใช้แล้วจากผู้ซื้อนำมาเอง

□ ใช้ภาชนะชนิดอื่น (ระบุ)……จากภายในฟาร์มของท่าน .....

□ ใช้ภาชนะชนิดอื่น (ระบุ)……จากผู้ซื้อนำมาเอง .....

10. ท่านจำหน่ายมูลไก่ ในราคาเท่าใด ?.....บาท/…….....(หน่วยบรรจุ)

11. มูลไก่ที่ท่านจำหน่ายมีลักษณะอย่างไร?

□ แห้ง □ ชื้น □ เปียก

12. ใครเป็นผู้บรรจุมูลไก่ลงภาชนะที่ใช้สำหรับบรรจุมูลไก่เพื่อจำหน่าย?

□ แรงงานภายในฟาร์ม □ แรงงานนอกฟาร์ม

13. ผู้ที่ทำการบรรจุมูลไก่ลงภาชนะเพื่อขายเป็นคนเดียวกับที่เลี้ยงไก่ หรือ ไม่?

□ ใช่ □ ไม่ใช่

14. วิธีการใดที่ใช้ในการขนส่งมูลไก่ให้กับผู้รับซื้อ?

□ ขนส่งโดยยานพาหนะของฟาร์ม □ ผู้ซื้อใช้ยานพานะของตัวเองในการขนส่ง

15. ยานพาหนะประเภทใดที่ใช้ในการขนส่งมูลไก่จากฟาร์มสู่ผู้รับซื้อ?

□ รถกระบะเปิดท้าย □ รถกระบะปิดท้าย □ รถจักรยานยนต์ □อื่นๆ (ระบุ)……

16. ความถี่ที่ท่านจำหน่ายมูลไก่?

□ สัปดาห์ละครั้ง □ สองสัปดาห์ครั้ง □ เดือนละครั้ง □อื่นๆ (ระบุ)……

17. ท่านได้มีการใช้ปุ๋ยที่ทำจากมูลไก่ภายในบริเวณฟาร์มของท่านหรือไม่?

□ ใช้ □ ไม่ได้ใช้ (ข้ามไปยังส่วน 1.2)

18. ปุ๋ยมูลไก่ที่ท่านใช้ภายในบริเวณฟาร์มมีลักษณะอย่างไร?

□ แห้ง □ ชื้น □ เปียก

ส่วนที่ 1.2 สัตว์ปีกมีชีวิต

	ไก่ปลด	ไก่ไข่ป่วยไก่ไข่ตาย /	ไก่ไข่ที่ร่างกายไม่สมบูรณ์
19. ท่านได้มีการขายสัตว์ปีกของท่านชนิดใดบ้าง และสัตว์ปีกชนิดนั้นๆ ได้ขายผ่านช่องทางการค้าใดบ้าง? (สามารถตอบได้มากกว่า 1 คำตอบ)	□ พ่อค้าขายส่ง/ผู้รวบรวมสินค้า □ พ่อค้าขายปลีก □ ผู้ชำแหละ/โรงเชือด □ ผู้บริโภค	□ พ่อค้าขายส่ง/ผู้รวบรวมสินค้า □ พ่อค้าขายปลีก □ ผู้ชำแหละ/โรงเชือด □ ผู้บริโภค	□ พ่อค้าขายส่ง/ผู้รวบรวมสินค้า □ พ่อค้าขายปลีก □ ผู้ชำแหละ/โรงเชือด □ ผู้บริโภค
20. จำนวนสัตว์ปีกต่อครั้งที่ท่านขายให้กับช่องทางการตลาดนั้นๆ?			
21. ท่านมีวิธีการขนส่งสัตว์ปีกไปยังผู้รับซื้ออย่างไร?	□ ท่านขนส่งไปยังผู้รับซื้อ □ ผู้ซื้อทำการขนส่งเองจากฟาร์ม	□ ท่านขนส่งไปยังผู้รับซื้อ □ ผู้ซื้อทำการขนส่งเองจากฟาร์ม	□ ท่านขนส่งไปยังผู้รับซื้อ □ ผู้ซื้อทำการขนส่งเองจากฟาร์ม

22. ประเภทของยานพาหนะที่ใช้ในการขนส่งสัตว์ปีก?	□ รถกระบะเปิดท้าย □ รถกระบะปิดท้าย □ รถจักรยานยนต์ □ อื่นๆ (ระบุ)……	□ รถกระบะเปิดท้าย □ รถกระบะปิดท้าย □ รถจักรยานยนต์ □ อื่นๆ (ระบุ)……	□ รถกระบะเปิดท้าย □ รถกระบะปิดท้าย □ รถจักรยานยนต์ □ อื่นๆ (ระบุ)……
23. ผลิตภัณฑ์ที่ใช้ในการบรรจุสัตว์ปีกสำหรับผู้รับซื้อ ทำจากวัสดุชนิดใด?	□ พลาสติก □ อะลูมิเนียม □ อื่นๆ (บุระ)……	□ พลาสติก □ อะลูมิเนียม □ อื่นๆ (ระบุ)……	□ พลาสติก □ อะลูมิเนียม □ อื่นๆ (ระบุ)……

24. ท่านมีวิธีการจัดการอย่างไรกับไก่ป่วย หรือ ไก่ที่ร่างกายไม่สมบูรณ์?

□ แยกออกจากฝูง นำไปไว้ที่เล้ากักสัตว์ป่วย ทำการรักษาตามอาการ แล้วนำกลับเข้าฝูงใหม่เมื่อเห็นว่าสัตว์ปีกฟื้นตัว หรือ อาการดีขึ้น

□ แยกออกจากฝูง นำไปไว้ที่เล้ากักสัตว์ป่วย ทำการรักษาตามอาการ แล้วทำการขาย เมื่อเห็นว่าสัตว์ปีกฟื้นตัว หรือ อาการดีขึ้น

□ แยกออกจากฝูง นำไปไว้ที่เล้ากักสัตว์ป่วย แล้วรีบทำการขายให้เร็วที่สุด

□ แยกออกจากฝูง นำไปไว้ที่เล้ากักสัตว์ป่วย แล้วรีบทำการฝัง หรือ เผาให้เร็วที่สุด

25. ท่านมีวิธีการจัดการอย่างไรกับไก่ไข่ที่ตาย?

□ บริโภคภายในครัวเรือน

□ ทำการฝังภายในบริเวณฟาร์ม

□ เผาในเตาเผาซากสัตว์ปีก

□ ขายให้ผู้รับซื้อ ได้แก่ ……..(ระบุ)……

26. น้ำที่ท่านใช้ภายในฟาร์มมีที่มาจากแหล่งน้ำชนิดใด?

□ แม่น้ำ □ น้ำบาดาล □ อื่นๆ (ระบุ)……

27. ฟาร์มของท่านเคยได้รับมาตรฐานฟาร์มผู้เลี้ยงไก่ไข่จากกรมปศุสัตว์ หรือ ไม่?

□ ได้รับ เมื่อ …… □ ไม่เคย เพราะ……

<u>ส่วนที่ 2 อไข้หวัดนกชนิดรุนแรงแบบสังเกตบทบาทผู้ผลิต เพื่อประเมินความเสี่ยงของเชื้อ (H5N1) ในเส้นทางการตลาดไก่ไข่ ณ ตำบล บ้านกลาง อำเภอ เมืองนครพนม จังหวัด นครพนม ประเทศไทย</u>

	ใช่/มี/ทำ	ไม่ใช่/ไม่มี/ไม่ได้ทำ	ไม่แน่ใจ
28. มีสัตว์ปีกชนิดอื่นภายในบริเวณฟาร์ม หรือ ไม่?			
29. เกษตรกรได้มีการเลี้ยงสัตว์ชนิดอื่น เช่น สุนัข หรือ แมว ภายในบริเวณฟาร์ม หรือ ไม่?			
30. ภายในฟาร์มมีเครื่องมือ อุปกรณ์ที่ใช้สำหรับฉีดพ่นน้ำยาฆ่าเชื้อ หรือ บ่อน้ำยาฆ่าเชื้อ สำหรับยานพาหนะก่อนเข้าฟาร์ม หรือ ไม่?			
31. ภายในฟาร์ม มีอ่างน้ำยาฆ่าเชื้อสำหรับจุ่มเท้าก่อนเข้าเล้าไก่ หรือ ไม่?			
32. ภายในฟาร์ม มีอ่างน้ำยาฆ่าเชื้อสำหรับจุ่มถาดไข่ หรือ ไม่?			
33. อ่างน้ำยาฆ่าเชื้อ บ่อน้ำยาฆ่าเชื้อ อุปกรณ์ฉีดพ่นน้ำยาฆ่าเชื้อ ได้อยู่ในสภาพที่พร้อมใช้งาน หรือ ไม่?			
34. เกษตรกรได้มีการแยกใช้ถาดไข่ที่มีการใช้ภายในฟาร์ม ออกจากถาดไข่ที่ใช้ภายในบริเวณที่ทำการคัดไข่ หรือ ไม่?			
35. เกษตรกรได้มีการแยกใช้ถาดไข่ที่ใช้ภายในบริเวณที่ทำการคัดไข่ ออกจากถาดไข่ที่บรรจุไข่ให้ผู้ซื้อ หรือ ไม่?			
36. บริเวณที่ทำการคัดไข่ มีสิ่งที่ช่วยในการป้องกันนกพาหะ ออกจากไข่หรือ ไม่?			
37. บริเวณที่เก็บอาหารสัตว์มีสิ่งที่ช่วยในการป้องกันนกพาหะ หรือ ไม่?			
38. โรงเรือนไก่ไข่ มีตาข่าย หรือ สิ่งที่ช่วยในการป้องกันพาหะของเชื้อไข้หวัดนกเข้าสู่โรงเรือน หรือ ไม่?			
39. ผู้เลี้ยงไก่ไข่ ได้ทำการสวมหน้ากาก และ ถุงมือ ระหว่างทำการเลี้ยงไก่ไข่ หรือ ไม่?			
40. ผู้เลี้ยงไก่ไข่ ได้ทำการล้างมือ หลังจากปฏิบัติงาน หรือ ไม่?			
41. ได้มีการเช็ด ทำความสะอาดเปลือกไข่ ก่อนทำการขาย หรือ ไม่?			

42. หลังจากเช็ด ทำความสะอาดเปลือกไข่ ผู้ปฏิบัติการนั้นๆ ได้มีการล้างมือ หรือ ไม่?			
43. ภายในฟาร์มมี บริเวณแยกเฉพาะ สำหรับไก่ป่วย หรือ ไก่ร่างกายไม่สมบูรณ์ หรือ ไม่?			
44. ภายในฟาร์ม มี เตาเผาซากสัตว์ปีก หรือ ไม่?			
45. น้ำเสียจากฟาร์มมีการปนเปื้อนสู่แหล่งน้ำชุมชน หรือ ไม่?			

<u>ส่วนที่ 3 แบบสัมภาษณ์บทบาทผู้ผลิต สำหรับ ความรู้ ทัศนคติ และการปฏิบัติที่เกี่ยวข้องกับการป้องกัน และควบคุมโรคไข้หวัดนกในฟาร์มไก่ไข่ ณ ตำบล บ้านกลาง อำเภอ เมืองนครพนม จังหวัดนครพนม ประเทศไทย</u>

ข้อมูลเบื้องต้น

1. ท่านเคยได้รับการฝึกอบรม เข้าร่วม หรือ เป็นส่วนหนึ่งของกิจกรรมที่ให้ความรู้ ความเข้าใจเกี่ยวกับเชื้อไข้หวัดนก หรือ ไม่?

   □ เคย เมื่อ……โดย……

   □ ไม่เคย

2. ท่านเคยได้รับประสบการณ์ตรงที่เกี่ยวข้องกับโรคไข้หวัดนก หรือ ไม่?

   □ เคย จาก

      □ สัตว์เลี้ยงของท่านเคยได้รับการสงสัยว่ามีการติดเชื้อไข้หวัดนก

      □ สมาชิกภายในครอบครัวได้รับการสงสัยว่าติดเชื้อไข้หวัดนก

   □ ไม่เคย

ส่วน 3.1 ความรู้ ความเข้าใจ

1. โรคไข้หวัดนกเกิดจากเชื้อชนิดใด?

□ ไวรัส □ แบคทีเรีย □ ปรสิต □ ไม่ทราบ

2. สัตว์ชนิดใดบ้างที่สามารถติดเชื้อไข้หวัดนก? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ เฉพาะไก่ □ สัตว์ปีกทุกชนิด □ สัตว์เลี้ยงลูกด้วยนม □ ไม่ทราบ

3. ลักษณะ และ อาการแสดงหลัก ในสัตว์ปีกที่ติดเชื้อไข้หวัดนกชนิดรุนแรง (H5N1) ได้แก่?

□ ซึม ขนยับและยุ่ง บริเวณเหนียง หงอน คอและเท้าบวม และมีสีเขียว เบื่ออาหาร ไอ ท้องร่วง ตายเฉียบพลันโดยไม่มีอาการแสดงเตือนล่วงหน้า

□ ซึม ถ่ายเหลวเป็นสีเขียว จาม ปีกตก กล้ามเนื้อสั่น รอบๆเนื้อเยื่อบริเวณตาและคอมีอาการบวม

□ ไม่ทราบ

4. มีวิธีรักษาสัตว์ปีกที่ติดเชื้อไข้หวัดนกชนิดรุนแรง หรือ ไม่?

□ มี □ ไม่มี □ ไม่ทราบ

5. เชื้อไข้หวัดนกสามารถติดต่อผ่านทางใดได้บ้างระหว่างสัตว์(สามารถตอบได้มากกว่า 1 คำตอบ)

□ จากการสัมผัสโดยตรงกับสัตว์ปีกที่ติดเชื้อ หรือ สัตว์ที่ติดเชื้อ

□ จากการสัมผัสโดยตรงกับไก่ตายที่สงสัยว่าติดเชื้อ และรับประทานเนื้อดิบ หรือ ปรุงไม่สุกจากไก่ตายนั้นๆ

□ จากการสัมผัสโดยตรงกับสิ่งคัดหลั่ง ได้แก่ อุจจาระ เยื่อเมือก น้ำลาย และน้ำตาจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ จากการสัมผัสกับยานพาหนะ เครื่องมือ หรือ อุปกรณ์ เช่น กรง สุ่ม หรือ ถาดไข่ ที่มีการปนเปื้อนสิ่งคัดหลั่งจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ ไม่ทราบ

6. ท่านคิดว่า เชื้อไข้หวัดนกสามารถแพร่ผ่านทางไข่ได้หรือไม่?

□ ได้ □ ไม่ได้ □ ไม่ทราบ

7. ท่านคิดว่า เชื้อไข้หวัดนกสามารถติดต่อจากสัตว์ หรือ นกพาหะ สู่คนได้ หรือ ไม่?

□ ได้ □ ไม่ได้ □ ไม่ทราบ

8. ท่านคิดว่า เชื้อไข้หวัดนกสามารถติดต่อระหว่างคนสู่คนได้ หรือ ไม่?

□ ได้ เพราะ……□ไม่ได้ เพราะ…….....□ ไม่ทราบ

9. คนสามารถติดเชื้อไข้หวัดนกได้อย่างไร?

□ จากการสัมผัสโดยตรงกับสัตว์ปีกที่ติดเชื้อ หรือ สัตว์ที่ติดเชื้อ

□ จากการสัมผัสโดยตรงกับไก่ตายที่สงสัยว่าติดเชื้อ และรับประทานเนื้อดิบ หรือ ปรุงไม่สุกจากไก่ตายนั้นๆ

□ จากการสัมผัสโดยตรงกับสิ่งคัดหลั่ง ได้แก่ อุจจาระ เยื่อเมือก น้ำลาย และน้ำตาจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ จากการสัมผัสกับยานพาหนะ เครื่องมือ หรือ อุปกรณ์ เช่น กรง สุ่ม หรือ ถาดไข่ ที่มีการปนเปื้อนสิ่งคัดหลั่งจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ ไม่ทราบ

10. ลักษณะ และ อาการแสดงหลัก ที่พบได้ในคนที่สงสัยว่าติดเชื้อไข้หวัดนกชนิดรุนแรง (H5N1) ได้แก่?

□ ไข้สูง ปวดหัว ไอ จาม เจ็บคอ ปวดกล้ามเนื้อ หายใจลำบาก

□ ตัวเหลือง อ่อนเพลีย เบื่ออาหาร ซึม

□ ไม่ทราบ

11. พฤติกรรมใดที่จัดว่ามีความเสี่ยงสูงต่อการได้รับเชื้อไข้หวัดนกมาสู่คน?

□ รับประทานเนื้อดิบ หรือ ปรุงไม่สุก ที่ได้จากสัตว์ปีกป่วย

□ รับประทานไข่ดิบ

□ ทั้งสองอย่าง

□ ไม่ทราบ

12. ท่านคิดว่าโรคไข้หวัดนกมีผลกระทบต่อชุมชนที่มีการเลี้ยงไก่ อย่างไรบ้าง?

□ เกิดอัตราการตายสูงในเฉพาะไก่

□ เกิดอัตราการตายสูงในสัตว์ปีกทั้งหมด

□ เกิดอัตราการตายสูงในสัตว์ปีก และสามารถติดเชื้อไปยังสัตว์อื่นๆ แต่ไม่สามารถติดต่อสู่คนได้

□ เกิดอัตราการตายสูงในสัตว์ปีก สามารถติดเชื้อไปยังสัตว์อื่นๆ และสามารถติดต่อสู่คนได้

13. ใครเป็นผู้ที่มีความไวต่อการได้รับเชื้อไข้หวัดนก ภายในบริเวณพื้นที่ที่มีการปนเปื้อนของเชื้อ?

□ เด็ก □ ผู้ใหญ่ □ผู้สูงอายุ □ เด็กและผู้สูงอายุ

14. บทบาทใดในเส้นทางการตลาดสัตว์ปีกที่จัดว่ามีความเสี่ยงสูงในการติดเชื้อ และ แพร่กระจายเชื้อไข้หวัดนก? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ เกษตรกร □ ผู้รวบรวมสินค้า, พ่อค้าขายส่ง, พ่อค้าขายปลีก

□ ธุรกิจที่เกี่ยวข้องกับสัตว์ปีกมีชีวิต□ ธุรกิจที่เกี่ยวข้องกับผลิตภัณฑ์สัตว์ปีก

□ ผู้บริโภค □ อื่นๆ (ระบุ).....

ส่วนที่ 3.2 ทัศนคติ

	เห็นด้วย/ พึงพอใจ	ไม่เห็นด้วย/ ไม่พอใจ	ไม่แน่ใจ
15. โรคไข้หวัดนกเป็นโรคที่ป้องกันได้			
16. ไก่ที่ติดเชื้อไข้หวัดนกไม่สามารถทำการรักษาได้			
17. ผู้ป่วยที่ติดเชื้อไข้หวัดนกไม่สามารถทำการรักษาได้			
18. เชื้อไข้หวัดนกเป็นเชื้อที่ก่อให้เกิดโรคร้ายแรง เพราะเชื้อสามารถเปลี่ยนแปลงพันธุกรรม ซึ่งก่อให้เกิดการระบาดร้ายแรงภายในคนได้			
19. นกเป็ดน้ำ เป็น แหล่งสะสมเชื้อไข้หวัดนกที่สำคัญ			
20. สัตว์ที่ติดเชื้อจะสามารถทำการขับเชื้อไวรัส ไข้หวัดนกออกมาได้ ถึงแม้จะไม่มีอาการแสดงใดๆ			
21. การสัมผัสโดยตรงกับไก่ป่วยเป็นการเพิ่มความเสี่ยงในการติดเชื้อไข้หวัดนก			
22. การรับประทานเนื้อดิบ หรือ ปรุงไม่สุกที่ได้รับจากไก่ป่วย เป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
23. การรับประทานไข่ดิบจากแหล่งที่มีการปนเปื้อนเชื้อไข้หวัดนก เป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			

24. การใช้ยานพาหนะเดียวกันในการขนส่งระหว่างสัตว์ปีกและคน เป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
25. อุปกรณ์เสื้อผ้า ,รองเท้าบูท ,ถุงอาหารพลาสติก , กรง , ที่มีการปนเปื้อนของเชื้อไข้หวัดนกสามารถก่อให้เกิดการแพร่กระจายของเชื้อไข้หวัดนกได้			
26. สัตว์ที่ติดเชื้อสามารถขับเชื้อไข้หวัดนกได้โดยเฉพาะทางสิ่งคัดหลั่ง เช่น อุจจาระ น้ำลาย เยื่อเมือก หรือเลือด			
27. บุคคลที่ทำงานเกี่ยวข้องกับสัตว์ปีก หรือ ผลิตภัณฑ์ที่ได้รับจากสัตว์ปีกมีความเสี่ยงในการได้รับเชื้อไข้หวัดนกสูงกว่าบุคคลทั่วไป			
28. ถ้าพบอาการแสดง ได้แก่ ไข้สูง หนาวสั่น เจ็บคอ หายใจลำบาก ในกลุ่มบุคคลที่ทำงานเกี่ยวข้องกับสัตว์ปีก บุคคลเหล่านี้ควรรีบไปพบแพทย์ทันที			
29. การใช้น้ำยาฆ่าเชื้อ หรือ สบู่ ในการทำความสะอาดเครื่องมือ อุปกรณ์ กรง เสื้อผ้า ฯลฯ สามารถป้องกันการติดเชื้อ และ แพร่กระจายของเชื้อไข้หวัดนกได้			
30. ท่านจัดว่าเป็นกลุ่มบุคคลที่มีความเสี่ยงในการติดเชื้อไข้หวัดนกสูง			
31. ท่านมีความคิดเห็นอย่างไรเกี่ยวกับนโยบายการทำลายสัตว์ปีกทุกทุกชนิดภายในระยะ กิโลเมตรจากจุดที่พบ 5 สัตว์ปีกติดเชื้อ			
32. ท่านมีความคิดเห็นอย่างไรกับนโยบายการทำลายสัตว์ปีกเฉพาะบริเวณที่พบสัตว์ปีกติดเชื้อ แล้วทำการเพิ่มการเฝ้าระวังและตรวจสอบเชื้อไข้หวัดนกในบริเวณรอบๆ			
33. ถ้าท่านพบว่า ไก่ที่ท่านเลี้ยงเกิดการตายอย่างกะทันหัน หรือ ป่วยโดยไม่ทราบสาเหตุเป็นจำนวนมาก เป็นระยะเวลามากกว่า วัน ท่านจะต้องทำการแจ้ง 1 เจ้าหน้าที่กรมปศุสัตว์ทันที			
34. ท่านมีความคิดเห็นอย่างไรเกี่ยวกับมูลค่าเงินชดเชยจากรัฐบาล ในกรณีที่สัตว์ปีกของท่านจำเป็นต้องถูกทำลาย			
35. ท่านคิดว่าพื้นที่ บริเวณ ตำบลบ้านกลาง มีความเสี่ยงในการเกิดโรคไข้หวัดนกซ้ำ หรือ ไม่?			
36. ท่านคิดว่าพื้นที่ บริเวณ ตำบลบ้านกลาง ควรจะมีระบบที่ดีในการเฝ้าระวังการเกิดโรคซึ่งเกิดจากการร่วมมือของชุมชนในการป้องกันการเกิดอุบัติการณ์ซ้ำของโรคไข้หวัดนก หรือ ไม่?			

ส่วนที่ 3.3 การปฏิบัติ

	ตลอดเวลา	บางครั้ง	ไม่เคยปฏิบัติ
37. ท่านมีการเลี้ยงสัตว์ปีกชนิดอื่นภายในบริเวณฟาร์ม			
38. ท่านมีการเลี้ยงสัตว์ชนิดอื่น เช่น สุนัข หรือ แมว ภายในบริเวณฟาร์ม			
39. ท่านมีการป้องกันตัวเองที่เหมาะสมก่อนทำการสัมผัสไก่ป่วยหรือ ตาย โดยการ สวมใส่อุปกรณ์ป้องกันตัวเอง เช่น หน้ากาก ถุงมือ ผ้ากันเปื้อน และรองเท้าบูท			
40. ท่านจะทำการล้างมือ และ เครื่องมือต่างๆที่ถูกใช้เกี่ยวข้องกับไก่ ภายหลังการปฏิบัติงาน			
41. ท่านมีการใช้สบู่ หรือ น้ำยาฆ่าเชื้อ เพื่อทำความสะอาดมือและเครื่องมือต่างๆ ภายหลังการปฏิบัติงาน			
42. ท่านมีการใช้น้ำยาฆ่าเชื้อ สำหรับจุ่ม หรือ ล้างถาดไข่ที่ได้รับมาจากภายนอกฟาร์ม			
43. ท่านได้มีการจุ่มน้ำยาฆ่าเชื้อรองเท้าบูทก่อนเข้าโรงเรือนไก่ไข่			
44. ท่านได้ทำการฉีดพ่นน้ำยาฆ่าเชื้อยานพาหนะก่อนเข้าเขตฟาร์ม			
45. ท่านได้ทำการแยกถาดไข่ที่ใช้ภายในฟาร์มออกจากถาดไข่ที่มีการใช้ภายนอกฟาร์ม			
46. ท่านได้มีการขออนุญาตการเคลื่อนย้ายลูกไก่อายุ วันจาก 1 ทางกรมปศุสัตว์เมื่อต้องการทดแทนไก่ในฟาร์ม			
47. ถ้าพบว่าสมาชิกภายในครอบครัวมีอาการแสดงคล้ายเป็นไข้หวัด ท่านจะรีบพาไปพบแพทย์			
48. คนงานภายในฟาร์มของท่านที่ทำการเลี้ยงไก่ หรือ ทำงานที่เกี่ยวข้องกับผลิตภัณฑ์ต่างๆของไก่ ได้รับการตรวจร่างกายทุกปี			
49. ถ้าพบการตายอย่างกะทันหัน และไม่ทราบสาเหตุภายในไก่ที่ท่านเลี้ยงเป็นระยะเวลามากกว่า วัน ท่านจะทำการแจ้งไป 1 ยังเจ้าหน้าที่กรมปศุสัตว์			

บทบาทผู้ค้าคนกลาง (ผู้รวบรวมสินค้า,พ่อค้าขายส่ง, และพ่อค้าขายปลีก)

ภายในแบบสอบถามประกอบไปด้วย 2 ส่วน ดังนี้

<u>ส่วนที่ 1 แบบสัมภาษณ์ผู้ค้าคนกลางสำหรับการประเมินความเสี่ยงของเชื้อไข้หวัดนกชนิดรุนแรง (H5N1)ในเส้นทางการตลาดไก่ไข่ ณ ตำบล บ้านกลาง อำเภอ เมืองนครพนม จังหวัด นครพนม ประเทศไทย</u>

คำอธิบาย : โปรดกากบาท X ลงในช่อง □ หน้าคำตอบที่เลือก หรือ เติมข้อมูลลงในช่องว่างที่เว้นไว้

1. ท่านได้มีการซื้อผลิตภัณฑ์สัตว์ปีกชนิดใดบ้าง? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ ไข่ไก่ □ ไก่มีชีวิต □ มูลไก่ๆ □อื่นๆ (ระบุ).....

2. โดยปกติ ท่านได้ทำการซื้อผลิตภัณฑ์สัตว์ปีกนั้นๆ จากกี่ฟาร์ม ในแต่ละครั้งของการซื้อสินค้า?

□ 1 □ 2-3 □ มากกว่า 4

3. ยานพาหนะประเภทใดที่ใช้ในการขนส่งผลิตภัณฑ์สัตว์นั้นๆจากฟาร์ม?

□ รถกระบะเปิดท้าย □ รถกระบะปิดท้าย □ รถจักรยานยนต์

□ รถแทรกเตอร์ □ อื่นๆ (ระบุ).....

4. เหตุผลใดที่ท่านเลือกซื้อผลิตภัณฑ์สัตว์จากแหล่งขายนั้นๆ(เลือกตอบเหตุผลที่มีอิทธิพลต่อท่านมากที่สุด)

□ ราคา □ ความสนิทสนม □ เงื่อนไขสัญญา

□ ความสะดวก □ อื่นๆ (ระบุ)……..

5. ท่านได้มีการใช้ยานพาหนะที่ใช้ในการขนส่งไก่ร่วมกับการขนส่งสัตว์ปีกชนิดอื่น หรือ ไม่?

□ ใช้ □ ไม่ใช้

6. ท่านได้มีการใช้ยานพาหนะที่ใช้ในการขนส่งสัตว์ปีกร่วมกับการขนส่งคน หรือ ไม่?

□ ใช้ □ ไม่ใช้

7. ท่านมีวิธีการอย่างไรในการขายสินค้าของท่าน?

□ ขายให้กับพ่อค้าขายปลีก ..... □ ขายให้กับพ่อค้าในตลาด……

□ ขายตรงสู่ผู้บริโภค □ ขายให้กับผู้ชำแหละ……...

□ อื่นๆ (ระบุ)…….

8. ท่านขายสินค้าของท่านไปยังแหล่งใด?

……

9. ท่านได้มีการใช้บรรจุภัณฑ์ เช่น ถาดไข่ หรือ กรง ของท่านเองหรือ ไม่?

□ ใช้ □ ไม่ใช้

10. บรรจุภัณฑ์ที่ใช้ทำจากวัสดุชนิดใด?

□ พลาสติก □ เหล็กอะลูมิเนียม/ □ ไม้ □ อื่นๆ (ระบุ)……

<u>ส่วนที่ 2 แบบสัมภาษณ์บทบาทผู้ค้าคนกลาง สำหรับ ความรู้ ทัศนคติ และการปฏิบัติที่เกี่ยวข้องกับการป้องกัน และควบคุมโรคไข้หวัดนกในฟาร์มไก่ไข่ ณ ตำบล บ้านกลาง อำเภอ เมืองนครพนม จังหวัด นครพนม ประเทศไทย</u>

ข้อมูลเบื้องต้น

1. ท่านเคยได้รับการฝึกอบรม เข้าร่วม หรือ เป็นส่วนหนึ่งของกิจกรรมที่ให้ความรู้ ความเข้าใจเกี่ยวกับเชื้อไข้หวัดนก หรือ ไม่?

   □ เคย เมื่อ……โดย……..

   □ ไม่เคย

2. ท่านเคยได้รับประสบการณ์ตรงที่เกี่ยวข้องกับโรคไข้หวัดนก หรือ ไม่?

   □ เคย จาก

      □ สัตว์เลี้ยงของท่านเคยได้รับการสงสัยว่ามีการติดเชื้อไข้หวัดนก

      □ สมาชิกภายในครอบครัวได้รับการสงสัยว่าติดเชื้อไข้หวัดนก

   □ ไม่เคย

ส่วน 2.1 ความรู้ ความเข้าใจ

1. โรคไข้หวัดนกเกิดจากเชื้อชนิดใด?

   □ ไวรัส □ แบคทีเรีย □ ปรสิต □ ไม่ทราบ

2. สัตว์ชนิดใดบ้างที่สามารถติดเชื้อไข้หวัดนก? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ เฉพาะไก่ □ สัตว์ปีกทุกชนิด □ สัตว์เลี้ยงลูกด้วยนม □ ไม่ทราบ

3. ลักษณะ และ อาการแสดงหลัก ในสัตว์ปีกที่ติดเชื้อไข้หวัดนกชนิดรุนแรง (H5N1) ได้แก่?

□ ซึม ขนยับและยุ่ง บริเวณเหนียง หงอน คอและเท้าบวม และมีสีเขียว เบื่ออาหาร ไอ ท้องร่วง ตายเฉียบพลันโดยไม่มีอาการแสดงเตือนล่วงหน้า

□ ซึม ถ่ายเหลวเป็นสีเขียว จาม ปีกตก กล้ามเนื้อสั่น รอบๆเนื้อเยื่อบริเวณตาและคอมีอาการบวม

□ ไม่ทราบ

4. มีวิธีรักษาสัตว์ปีกที่ติดเชื้อไข้หวัดนกชนิดรุนแรง หรือ ไม่?

□ มี □ ไม่มี □ ไม่ทราบ

5. เชื้อไข้หวัดนกสามารถติดต่อผ่านทางใดได้บ้างระหว่างสัตว์(สามารถตอบได้มากกว่า 1 คำตอบ)

□ จากการสัมผัสโดยตรงกับสัตว์ปีกที่ติดเชื้อ หรือ สัตว์ที่ติดเชื้อ

□ จากการสัมผัสโดยตรงกับไก่ตายที่สงสัยว่าติดเชื้อ และรับประทานเนื้อดิบ หรือ ปรุงไม่สุกจากไก่ตายนั้นๆ

□ จากการสัมผัสโดยตรงกับสิ่งคัดหลั่ง ได้แก่ อุจจาระ เยื่อเมือก น้ำลาย และน้ำตาจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ จากการสัมผัสกับยานพาหนะ เครื่องมือ หรือ อุปกรณ์ เช่น กรง สุ่ม หรือ ถาดไข่ ที่มีการปนเปื้อนสิ่งคัดหลั่งจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ ไม่ทราบ

6. ท่านคิดว่า เชื้อไข้หวัดนกสามารถแพร่ผ่านทางไข่ได้หรือไม่?

□ ได้ □ ไม่ได้ □ ไม่ทราบ

7. ท่านคิดว่า เชื้อไข้หวัดนกสามารถติดต่อจากสัตว์ หรือ นกพาหะ สู่คนได้ หรือ ไม่?

□ ได้ □ ไม่ได้ □ ไม่ทราบ

8. ท่านคิดว่า เชื้อไข้หวัดนกสามารถติดต่อระหว่างคนสู่คนได้ หรือ ไม่?

□ ได้ เพราะ……□ไม่ได้ เพราะ…….....□ ไม่ทราบ

9. คนสามารถติดเชื้อไข้หวัดนกได้อย่างไร?

□ จากการสัมผัสโดยตรงกับสัตว์ปีกที่ติดเชื้อ หรือ สัตว์ที่ติดเชื้อ

□ จากการสัมผัสโดยตรงกับไก่ตายที่สงสัยว่าติดเชื้อ และรับประทานเนื้อดิบ หรือ ปรุงไม่สุกจากไก่ตายนั้นๆ

□ จากการสัมผัสโดยตรงกับสิ่งคัดหลั่ง ได้แก่ อุจจาระ เยื่อเมือก น้ำลาย และน้ำตาจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ จากการสัมผัสกับยานพาหนะ เครื่องมือ หรือ อุปกรณ์ เช่น กรง สุ่ม หรือ ถาดไข่ ที่มีการปนเปื้อนสิ่งคัดหลั่งจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ ไม่ทราบ

10. ลักษณะ และ อาการแสดงหลัก ที่พบได้ในคนที่สงสัยว่าติดเชื้อไข้หวัดนกชนิดรุนแรง (H5N1) ได้แก่?

□ ไข้สูง ปวดหัว ไอ จาม เจ็บคอ ปวดกล้ามเนื้อ หายใจลำบาก

□ ตัวเหลือง อ่อนเพลีย เบื่ออาหาร ซึม

□ ไม่ทราบ

11. พฤติกรรมใดที่จัดว่ามีความเสี่ยงสูงต่อการได้รับเชื้อไข้หวัดนกมาสู่คน?

□ รับประทานเนื้อดิบ หรือ ปรุงไม่สุก ที่ได้จากสัตว์ปีกป่วย

□ รับประทานไข่ดิบ

□ ทั้งสองอย่าง

□ ไม่ทราบ

12. ท่านคิดว่าโรคไข้หวัดนกมีผลกระทบต่อชุมชนที่มีการเลี้ยงไก่ อย่างไรบ้าง?

□ เกิดอัตราการตายสูงในเฉพาะไก่

□ เกิดอัตราการตายสูงในสัตว์ปีกทั้งหมด

□ เกิดอัตราการตายสูงในสัตว์ปีก และสามารถติดเชื้อไปยังสัตว์อื่นๆ แต่ไม่สามารถติดต่อสู่คนได้

□ เกิดอัตราการตายสูงในสัตว์ปีก สามารถติดเชื้อไปยังสัตว์อื่นๆ และสามารถติดต่อสู่คนได้

13. ใครเป็นผู้ที่มีความไวต่อการได้รับเชื้อไข้หวัดนก ภายในบริเวณพื้นที่ที่มีการปนเปื้อนของเชื้อ?

□ เด็ก □ ผู้ใหญ่ □ผู้สูงอายุ □ เด็กและผู้สูงอายุ

14. บทบาทใดในเส้นทางการตลาดสัตว์ปีกที่จัดว่ามีความเสี่ยงสูงในการติดเชื้อ และ แพร่กระจายเชื้อไข้หวัดนก? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ เกษตรกร □ ผู้รวบรวมสินค้า, พ่อค้าขายส่ง, พ่อค้าขายปลีก

□ ธุรกิจที่เกี่ยวข้องกับสัตว์ปีกมีชีวิต□ ธุรกิจที่เกี่ยวข้องกับผลิตภัณฑ์สัตว์ปีก

□ ผู้บริโภค □ อื่นๆ (ระบุ).....

ส่วนที่ 2.2 ทัศนคติ

	เห็นด้วย/พึงพอใจ	ไม่เห็นด้วย/ไม่พอใจ	ไม่แน่ใจ
15. โรคไข้หวัดนกเป็นโรคที่ป้องกันได้			
16. ไก่ที่ติดเชื้อไข้หวัดนกไม่สามารถทำการรักษาได้			
17. ผู้ป่วยที่ติดเชื้อไข้หวัดนกไม่สามารถทำการรักษาได้			
18. เชื้อไข้หวัดนกเป็นเชื้อที่ก่อให้เกิดโรคร้ายแรง เพราะเชื้อสามารถเปลี่ยนแปลงพันธุกรรม ซึ่งก่อให้เกิดการระบาดร้ายแรงภายในคนได้			
19. นกเป็ดน้ำ เป็น แหล่งสะสมเชื้อไข้หวัดนกที่สำคัญ			
20. สัตว์ที่ติดเชื้อจะสามารถทำการขับเชื้อไวรัส ไข้หวัดนกออกมาได้ถึงแม้จะไม่มีอาการแสดงใดๆ			
21. การสัมผัสโดยตรงกับไก่ป่วยเป็นการเพิ่มความเสี่ยงในการติดเชื้อไข้หวัดนก			
22. การรับประทานเนื้อดิบ หรือ ปรุงไม่สุกที่ได้รับจากไก่ป่วย เป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
23. การรับประทานไข่ดิบจากแหล่งที่มีการปนเปื้อนเชื้อไข้หวัดนก เป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
24. การใช้ยานพาหนะเดียวกันในการขนส่งระหว่างสัตว์ปีกและคน เป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
25. อุปกรณ์เสื้อผ้า ที่มีการ ,บูทรองเท้า ,ถุงอาหารพลาสติก , กรง , ปนเปื้อนของเชื้อไข้หวัดนกสามารถก่อให้เกิดการแพร่กระจาย ของเชื้อไข้หวัดนกได้			
26. สัตว์ที่ติดเชื้อสามารถขับเชื้อไข้หวัดนกได้โดยเฉพาะทางสิ่งคัดหลั่ง เช่น อุจจาระ น้ำลาย เยื่อเมือก หรือ เลือด			
27. บุคคลที่ทำงานเกี่ยวข้องกับสัตว์ปีก หรือ ผลิตภัณฑ์ที่ได้รับจากสัตว์ปีกมีความเสี่ยงในการได้รับเชื้อไข้หวัดนกสูงกว่าบุคคลทั่วไป			

28. ถ้าพบอาการแสดง ได้แก่ ไข้สูง หนาวสั่น เจ็บคอ หายใจลำบาก ในกลุ่มบุคคลที่ทำงานเกี่ยวข้องกับสัตว์ปีก บุคคลเหล่านี้ควรรีบไปพบแพทย์ทันที			
29. การใช้น้ำยาฆ่าเชื้อ หรือ สบู่ ในการทำความสะอาดเครื่องมือ อุปกรณ์ กรง เสื้อผ้า ฯลณ สามารถป้องกันการติดเชื้อ และแพร่กระจายของเชื้อไข้หวัดนกได้			
30. ท่านจัดว่าเป็นกลุ่มบุคคลที่มีความเสี่ยงในการติดเชื้อไข้หวัดนกสูง			
31. ท่านมีความคิดเห็นอย่างไรเกี่ยวกับนโยบายการทำลายสัตว์ปีกทุกทุกชนิดภายในระยะ 5 กิโลเมตรจากจุดที่พบสัตว์ปีกติดเชื้อ			
32. ท่านคิดว่าผู้ค้าคนกลาง มีบทบาทสำคัญในการช่วยป้องกันการแพร่กระขายของเชื้อไข้หวัดนก			
33. ท่านมีความคิดเห็นอย่างไรเกี่ยวกับกฎหมายในการเคลื่อนย้ายสัตว์			
34. ท่านมีความคิดเห็นอย่างไรกับนโยบายการกักกันที่รวมไปถึงผลิตภัณฑ์สัตว์ปีกเมื่อเกิดการระบาดของโรคไข้หวัดนก			
35. ท่านมีความคิดเห็นอย่างไรกับนโยบายการทำลายสัตว์ปีกเฉพาะบริเวณที่พบสัตว์ปีกติดเชื้อ แล้วทำการเพิ่มการเฝ้าระวังและตรวจสอบเชื้อไข้หวัดนกในบริเวณรอบๆ			
36. ถ้าท่านพบว่า ไก่ที่ท่านเลี้ยงเกิดการตายอย่างกะทันหัน หรือ ป่วยโดยไม่ทราบสาเหตุเป็นจำนวนมาก เป็นระยะเวลามากกว่า วัน 1 ท่านจะต้องทำการแจ้งเจ้าหน้าที่กรมปศุสัตว์ทันที			
37. ท่านมีความคิดเห็นอย่างไรเกี่ยวกับมูลค่าเงินชดเชยจากรัฐบาลในกรณีที่สัตว์ปีกของท่านจำเป็นต้องถูกทำลาย			
38. ท่านคิดว่าพื้นที่ บริเวณ ตำบลบ้านกลาง มีความเสี่ยงในการเกิดโรคไข้หวัดนกซ้ำ หรือ ไม่?			
39. ท่านคิดว่าพื้นที่ บริเวณ ตำบลบ้านกลาง ควรจะมีระบบที่ดีในการเฝ้าระวังการเกิดโรคซึ่งเกิดจากการร่วมมือของชุมชนในการป้องกันการเกิดอุบัติการณ์ซ้ำของโรคไข้หวัดนก หรือ ไม่?			

ส่วนที่ 2.3 การปฏิบัติ

	ตลอดเวลา	บางครั้ง	ไม่เคยปฏิบัติ
****กรุณา<u>ตอบข้อ 40-47 กรณีที่ท่านมีการรับซื้อไก่ปลดที่ยังไม่ผ่านการชำแหละ</u> หากท่านไม่ได้ทำรับซื้อไก่ปลด ข้ามไปตอบยังข้อ 48 **** 40. ท่านมีการป้องกันตัวเองที่เหมาะสมก่อนทำการสัมผัสไก่ป่วยหรือ ตาย โดยการ สวมใส่อุปกรณ์ป้องกันตัวเอง เช่น หน้ากาก ถุงมือ ผ้ากันเปื้อน และรองเท้าบูท			

41. ท่านจะทำการล้างมือ และ เครื่องมือต่างๆที่ถูกใช้เกี่ยวข้องกับไก่ ภายหลังการปฏิบัติงาน			
42. ท่านมีการใช้สบู่ หรือ น้ำยาฆ่าเชื้อ เพื่อทำความสะอาดมือ และเครื่องมือต่างๆ ภายหลังการปฏิบัติงาน			
43. ท่านได้ใช้ยานพาหนะเดียวกันในการขนส่งระหว่างไก่และสัตว์ปีกชนิดอื่น			
44. ท่านได้ใช้ยานพาหนะเดียวกันในการขนส่งระหว่างสัตว์ปีกและคน			
45. ถ้าท่านพบการตายอย่างไม่ทราบสาเหตุของไก่ที่ท่านซื้อระหว่างขนส่งท่านจะแจ้งเจ้าหน้าที่กรมปศุสัตว์			
46. ท่านได้ทำการจุ่ม ล้าง ถาดไข่ด้วยน้ำยาฆ่าเชื้อก่อนนำกลับมาใช้ซ้ำ			
47. ท่านได้ทำการฉีดพ่นน้ำยาฆ่าเชื้อยานพาหนะก่อนเข้าเขตฟาร์ม			
48. ท่านได้ทำการแยกถาดไข่ที่ใช้ภายในฟาร์มออกจากถาดไข่ที่มีการใช้ภายนอกฟาร์ม			
49. ท่านได้ใช้บรรจุภัณฑ์ของท่านในการบรรจุผลิตภัณฑ์ต่างๆ เช่น ถาดไข่ กรง			
50. ท่านได้ทำการคืนผลิตภัณฑ์สัตว์ปีกนั้นๆให้กับแหล่งที่ท่านซื้อหากท่านไม่สามารถทำการขายได้หมด			
51. ถ้าพบว่าสมาชิกภายในครอบครัวมีอาการแสดงคล้ายเป็นไข้หวัด ท่านจะรีบพาไปพบแพทย์			
52. คนงานที่ทำงานเกี่ยวข้องกับไก่ หรือ ผลิตภัณฑ์ต่างๆของไก่ได้รับการตรวจร่างกายทุกปี			

บทบาทผู้ค้าชำแหละ(โรงเชือด/ผู้ค้าชำแหละ)

ภายในแบบสอบถามประกอบไปด้วย 2 ส่วน ดังนี้

<u>ส่วนที่ 1 แบบสัมภาษณ์ผู้ชำแหละสำหรับการประเมินความเสี่ยงของเชื้อไข้หวัดนกชนิดรุนแรง (H5N1) ในเส้นทางการตลาดไก่ไข่ ณ ตำบล บ้านกลาง อำเภอ เมืองนครพนม จังหวัด นครพนม ประเทศไทย</u>

คำอธิบาย : โปรดกากบาท X ลงในช่อง □ หน้าคำตอบที่เลือก หรือ เติมข้อมูลลงในช่องว่างที่เว้นไว้

1. ชนิดใดของสัตว์ปีกที่ท่านทำการชำแหละ? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ ไก่ปลด □ ไก่ป่วย □ไก่ร่างกายไม่สมบูรณ์ □ อื่นๆ (ระบุ)……

2. ผลิตภัณฑ์สัตว์ปีกลักษณะใดที่ท่านทำการซื้อมาเพื่อขาย? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ สัตว์ปีกมีชีวิต □ สัตว์ปีกไม่มีชีวิต □ สัตว์ปีกที่ถอนขนแล้ว

3. ท่านซื้อผลิตภัณฑ์สัตว์ปีกนั้นๆจากแหล่งใด? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ ฟาร์ม……□ ผู้ค้าคนกลาง…… □ อื่นๆ (ระบุ)……..

4. เหตุผลใดที่ท่านเลือกซื้อผลิตภัณฑ์สัตว์จากแหล่งขายนั้นๆ(เลือกตอบเหตุผลที่มีอิทธิพลต่อท่านมากที่สุด)

□ ราคา □ ความสนิทสนม □ เงื่อนไขสัญญา

□ ความสะดวก □ อื่นๆ (ระบุ)……..

5. โดยปกติ ท่านได้ทำการซื้อผลิตภัณฑ์สัตว์ปีกนั้นๆ เป็นจำนวนเท่าใดในแต่ละครั้งของการซื้อสินค้าจากแหล่งนั้นๆ?.....

6. วิธีการใดที่ใช้ในการขนส่งผลิตภัณฑ์สัตว์ปีกนั้นๆ มาให้แก่ท่าน?

□ ขนส่งโดยเจ้าของฟาร์ม …… □ขนส่งโดยผู้คนคนกลาง……

□ ท่านทำการขนส่งเองจากฟา.....□ อื่นๆ ระบุ))……

7. ท่านได้มีการใช้บรรจุภัณฑ์ของท่านเอง เช่น กรง เมื่อท่านซื้อไก่จากแหล่งที่ขาย?

□ ใช้ □ ไม่ใช้

8. บรรจุภัณฑ์ที่ใช้ทำจากวัสดุชนิดใด?

□ พลาสติก □ เหล็กอะลูมิเนียม/ □ ไม้ □ อื่นๆ (ระบุ)……

9. ท่านได้มีการขายสัตว์ปีกที่ผ่านการชำแหละแล้วให้แก่แหล่งใด?

□ ขายตรงสู่ผู้บริโภค □ ขายให้กับพ่อค้าในตลาด □ขายให้พ่อค้าคนกลาง

□ อื่นๆ (ระบุ)…….

10. โดยปกติ ในแต่ละครั้งท่านขายสัตว์ปีกที่ชำแหละแล้วให้กับผู้รับซื้อเป็นจำนวน?.....

11. น้ำที่ท่านใช้ภายในบริเวณการชำแหละสัตว์ปีกมีที่มาจากแหล่งน้ำชนิดใด?

□ แม่น้ำ □ น้ำบาดาล □ อื่นๆ (ระบุ)……

12. ท่านมีวิธีการจัดการน้ำเสียอย่างไร?

.....

13. ท่านมีวิธีการจัดการอย่างไรกับผลิตภัณฑ์ที่เหลือทิ้งจากการชำแหละ เช่น ซากไก่?

.....

<u>ส่วนที่ 2 แบบสัมภาษณ์บทบาทผู้ชำแหละ สำหรับ ความรู้ ทัศนคติ และการปฏิบัติที่เกี่ยวข้องกับการป้องกัน และควบคุมโรคไข้หวัดนกในฟาร์มไก่ไข่ ณ ตำบล บ้านกลาง อำเภอ เมืองนครพนม จังหวัดนครพนม ประเทศไทย</u>

ข้อมูลเบื้องต้น

1. ท่านเคยได้รับการฝึกอบรม เข้าร่วม หรือ เป็นส่วนหนึ่งของกิจกรรมที่ให้ความรู้ ความเข้าใจ เกี่ยวกับเชื้อไข้หวัดนก หรือ ไม่?

□ เคย เมื่อ……โดย……

□ ไม่เคย

2. ท่านเคยได้รับประสบการณ์ตรงที่เกี่ยวข้องกับโรคไข้หวัดนก หรือ ไม่?

□ เคย จาก

□ สัตว์เลี้ยงของท่านเคยได้รับการสงสัยว่ามีการติดเชื้อไข้หวัดนก

□ สมาชิกภายในครอบครัวได้รับการสงสัยว่าติดเชื้อไข้หวัดนก

□ ไม่เคย

ส่วน 2.1ความรู้ ความเข้าใจ

1. โรคไข้หวัดนกเกิดจากเชื้อชนิดใด?

□ ไวรัส □ แบคทีเรีย □ ปรสิต □ ไม่ทราบ

2. สัตว์ชนิดใดบ้างที่สามารถติดเชื้อไข้หวัดนก? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ เฉพาะไก่ □ สัตว์ปีกทุกชนิด □ สัตว์เลี้ยงลูกด้วยนม □ ไม่ทราบ

3. ลักษณะ และ อาการแสดงหลัก ในสัตว์ปีกที่ติดเชื้อไข้หวัดนกชนิดรุนแรง (H5N1) ได้แก่?

□ ซึม ขนยับและยุ่ง บริเวณเหนียง หงอน คอและเท้าบวม และมีสีเขียว เบื่ออาหาร ไอ ท้องร่วง ตายเฉียบพลันโดยไม่มีอาการแสดงเตือนล่วงหน้า

□ ซึม ถ่ายเหลวเป็นสีเขียว จาม ปีกตก กล้ามเนื้อสั่น รอบๆเนื้อเยื่อบริเวณตาและคอมีอาการบวม

□ ไม่ทราบ

4. มีวิธีรักษาสัตว์ปีกที่ติดเชื้อไข้หวัดนกชนิดรุนแรง หรือ ไม่?

□ มี □ ไม่มี □ ไม่ทราบ

5. เชื้อไข้หวัดนกสามารถติดต่อผ่านทางใดได้บ้างระหว่างสัตว์(สามารถตอบได้มากกว่า 1 คำตอบ)

□ จากการสัมผัสโดยตรงกับสัตว์ปีกที่ติดเชื้อ หรือ สัตว์ที่ติดเชื้อ

□ จากการสัมผัสโดยตรงกับไก่ตายที่สงสัยว่าติดเชื้อ และรับประทานเนื้อดิบ หรือ ปรุงไม่สุกจากไก่ตายนั้นๆ

□ จากการสัมผัสโดยตรงกับสิ่งคัดหลั่ง ได้แก่ อุจจาระ เยื่อเมือก น้ำลาย และน้ำตาจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ จากการสัมผัสกับยานพาหนะ เครื่องมือ หรือ อุปกรณ์ เช่น กรง สุ่ม หรือ ถาดไข่ ที่มีการปนเปื้อนสิ่งคัดหลั่งจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ ไม่ทราบ

6. ท่านคิดว่า เชื้อไข้หวัดนกสามารถแพร่ผ่านทางไข่ได้หรือไม่?

□ ได้ □ ไม่ได้ □ ไม่ทราบ

7. ท่านคิดว่า เชื้อไข้หวัดนกสามารถติดต่อจากสัตว์ หรือ นกพาหะ สู่คนได้ หรือ ไม่?

□ ได้ □ ไม่ได้ □ ไม่ทราบ

8. ท่านคิดว่า เชื้อไข้หวัดนกสามารถติดต่อระหว่างคนสู่คนได้ หรือ ไม่?

□ ได้ เพราะ……□ไม่ได้ เพราะ…….....□ ไม่ทราบ

9. คนสามารถติดเชื้อไข้หวัดนกได้อย่างไร?

□ จากการสัมผัสโดยตรงกับสัตว์ปีกที่ติดเชื้อ หรือ สัตว์ที่ติดเชื้อ

□ จากการสัมผัสโดยตรงกับไก่ตายที่สงสัยว่าติดเชื้อ และรับประทานเนื้อดิบ หรือ ปรุงไม่สุกจากไก่ตายนั้นๆ

□ จากการสัมผัสโดยตรงกับสิ่งคัดหลั่ง ได้แก่ อุจจาระ เยื่อเมือก น้ำลาย และน้ำตาจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ จากการสัมผัสกับยานพาหนะ เครื่องมือ หรือ อุปกรณ์ เช่น กรง สุ่ม หรือ ถาดไข่ ที่มีการปนเปื้อนสิ่งคัดหลั่งจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ ไม่ทราบ

10. ลักษณะ และ อาการแสดงหลัก ที่พบได้ในคนที่สงสัยว่าติดเชื้อไข้หวัดนกชนิดรุนแรง (H5N1) ได้แก่?

□ ไข้สูง ปวดหัว ไอ จาม เจ็บคอ ปวดกล้ามเนื้อ หายใจลำบาก

□ ตัวเหลือง อ่อนเพลีย เบื่ออาหาร ซึม

□ ไม่ทราบ

11. พฤติกรรมใดที่จัดว่ามีความเสี่ยงสูงต่อการได้รับเชื้อไข้หวัดนกมาสู่คน?

□ รับประทานเนื้อดิบ หรือ ปรุงไม่สุก ที่ได้จากสัตว์ปีกป่วย

□ รับประทานไข่ดิบ

□ ทั้งสองอย่าง

□ ไม่ทราบ

12. ท่านคิดว่าโรคไข้หวัดนกมีผลกระทบต่อชุมชนที่มีการเลี้ยงไก่ อย่างไรบ้าง?

□ เกิดอัตราการตายสูงในเฉพาะไก่

□ เกิดอัตราการตายสูงในสัตว์ปีกทั้งหมด

□ เกิดอัตราการตายสูงในสัตว์ปีก และสามารถติดเชื้อไปยังสัตว์อื่นๆ แต่ไม่สามารถติดต่อสู่คนได้

□ เกิดอัตราการตายสูงในสัตว์ปีก สามารถติดเชื้อไปยังสัตว์อื่นๆ และสามารถติดต่อสู่คนได้

13. ใครเป็นผู้ที่มีความไวต่อการได้รับเชื้อไข้หวัดนก ภายในบริเวณพื้นที่ที่มีการปนเปื้อนของเชื้อ?

□ เด็ก □ ผู้ใหญ่ □ผู้สูงอายุ □ เด็กและผู้สูงอายุ

14. บทบาทใดในเส้นทางการตลาดสัตว์ปีกที่จัดว่ามีความเสี่ยงสูงในการติดเชื้อ และ แพร่กระจายเชื้อไข้หวัดนก? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ เกษตรกร □ ผู้รวบรวมสินค้า, พ่อค้าขายส่ง, พ่อค้าขายปลีก

□ ธุรกิจที่เกี่ยวข้องกับสัตว์ปีกมีชีวิต□ ธุรกิจที่เกี่ยวข้องกับผลิตภัณฑ์สัตว์ปีก

□ ผู้บริโภค □ อื่นๆ (ระบุ).....

ส่วนที่ 2.2ทัศนคติ

	เห็นด้วย/พึงพอใจ	ไม่เห็นด้วย/ไม่พอใจ	ไม่แน่ใจ
15. โรคไข้หวัดนกเป็นโรคที่ป้องกันได้			
16. ไก่ที่ติดเชื้อไข้หวัดนกไม่สามารถทำการรักษาได้			
17. ผู้ป่วยที่ติดเชื้อไข้หวัดนกไม่สามารถทำการรักษาได้			
18. เชื้อไข้หวัดนกเป็นเชื้อที่ก่อให้เกิดโรคร้ายแรง เพราะเชื้อสามารถเปลี่ยนแปลงพันธุกรรม ซึ่งก่อให้เกิดการระบาดร้ายแรงภายในคนได้			
19. นกเป็ดน้ำ เป็น แหล่งสะสมเชื้อไข้หวัดนกที่สำคัญ			
20. สัตว์ที่ติดเชื้อจะสามารถทำการขับเชื้อไวรัส ไข้หวัดนกออกมาได้ ถึงแม้จะไม่มีอาการแสดงใดๆ			
21. การสัมผัสโดยตรงกับไก่ป่วยเป็นการเพิ่มความเสี่ยงในการติดเชื้อไข้หวัดนก			
22. การรับประทานเนื้อดิบ หรือ ปรุงไม่สุกที่ได้รับจากไก่ป่วย เป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
23. การรับประทานไข่ดิบจากแหล่งที่มีการปนเปื้อนเชื้อไข้หวัดนกเป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
24. การใช้ยานพาหนะเดียวกันในการขนส่งระหว่างสัตว์ปีกและคนเป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
25. อุปกรณ์เสื้อผ้า ที่มีการ ,รองเท้าบูท ,ถุงอาหารพลาสติก , กรง , ปนเปื้อนของเชื้อไข้หวัดนกสามารถก่อให้เกิดการแพร่กระจายของเชื้อไข้หวัดนกได้			
26. สัตว์ที่ติดเชื้อสามารถขับเชื้อไข้หวัดนกได้โดยเฉพาะทางสิ่งคัดหลั่ง เช่น อุจจาระ น้ำลาย เยื่อเมือก หรือ เลือด			
27. บุคคลที่ทำงานเกี่ยวข้องกับสัตว์ปีก หรือ ผลิตภัณฑ์ที่ได้รับจากสัตว์ปีกมีความเสี่ยงในการได้รับเชื้อไข้หวัดนกสูงกว่าบุคคลทั่วไป			

28. ถ้าพบอาการแสดง ได้แก่ ไข้สูง หนาวสั่น เจ็บคอ หายใจลำบาก ในกลุ่มบุคคลที่ทำงานเกี่ยวข้องกับสัตว์ปีก บุคคลเหล่านี้ควรรีบไปพบแพทย์ทันที			
29. การใช้น้ำยาฆ่าเชื้อ หรือ สบู่ ในการทำความสะอาดเครื่องมืออุปกรณ์ กรง เสื้อผ้า ฯลณ สามารถป้องกันการติดเชื้อ และแพร่กระจายของเชื้อไข้หวัดนกได้			
30. ท่านจัดว่าเป็นกลุ่มบุคคลที่มีความเสี่ยงในการติดเชื้อไข้หวัดนกสูง			
31. ท่านคิดว่าผู้ชำแหละ มีบทบาทสำคัญในการช่วยป้องกันการแพร่กระจายของเชื้อไข้หวัดนก			
32. ท่านมีความคิดเห็นอย่างไรเกี่ยวกับกฎหมายของระดับความปลอดภัยทางชีวภาพของโรงเชือดสถานที่เชือดสัตว์/			
33. ท่านมีความคิดเห็นอย่างไรกับนโยบายการกักกันที่รวมไปถึงผลิตภัณฑ์สัตว์ปีกเมื่อเกิดการระบาดของโรคไข้หวัดนก			
34. ท่านคิดว่าพื้นที่ บริเวณ ตำบลบ้านกลาง มีความเสี่ยงในการเกิดโรคไข้หวัดนกซ้ำ หรือ ไม่?			
35. ท่านคิดว่า โรงเชือด สถานที่เชือดสัตว์/ควรจะตั้งอยู่ห่างจากเขตชุมชน			
36. ท่านคิดว่าพื้นที่ บริเวณ ตำบลบ้านกลาง ควรจะมีระบบที่ดีในการเฝ้าระวังการเกิดโรคซึ่งเกิดจากการร่วมมือของชุมชนในการป้องกันการเกิดอุบัติการณ์ซ้ำของโรคไข้หวัดนก หรือ ไม่?			

ส่วนที่ 2.3 การปฏิบัติ

	ตลอดเวลา	บางครั้ง	ไม่เคยปฏิบัติ
37. ท่านมีการป้องกันตัวเองที่เหมาะสมก่อนทำการสัมผัสไก่ป่วยหรือ ตาย โดยการ สวมใส่อุปกรณ์ป้องกันตัวเอง เช่น หน้ากาก ถุงมือ ผ้ากันเปื้อน และรองเท้าบูท			
38. ท่านจะทำการล้างมือ และ เครื่องมือต่างๆที่ถูกใช้เกี่ยวข้องกับไก่ ภายหลังการปฏิบัติงาน			
39. ท่านมีการใช้สบู่ หรือ น้ำยาฆ่าเชื้อ เพื่อทำความสะอาดมือและเครื่องมือต่างๆ ภายหลังการปฏิบัติงาน			
40. ท่านได้ทำการฉีดพ่นน้ำยาฆ่าเชื้อยานพาหนะก่อนออกจากเขตชำแหละ			
41. ท่านได้ใช้บรรจุภัณฑ์ของท่านในการบรรจุผลิตภัณฑ์ต่างๆ เช่น กรง			
42. ท่านได้ทำการตรวจสอบมาตรฐานของโรงเชือดสถานที่เชือด/สถานที่/ของท่านให้เป็นไปตามระดับมาตรฐานของโรงเชือดกรมปศุสัตว์เชือดสัตว์ ของ			

43. ท่านได้ใช้ยานพาหนะเดียวกันในการขนส่งระหว่างไก่และสัตว์ปีกชนิดอื่น			
44. ท่านได้ใช้ยานพาหนะเดียวกันในการขนส่งระหว่างสัตว์ปีกและคน			
45. ท่านได้ทำการคืนผลิตภัณฑ์สัตว์ปีกนั้นๆให้กับแหล่งที่ท่านซื้อหากท่านไม่สามารถทำการขายได้หมด			
46. ถ้าพบว่าสมาชิกภายในครอบครัวมีอาการแสดงคล้ายเป็นไข้หวัด ท่านจะรีบพาไปพบแพทย์			
47. คนงานภายในฟาร์มของท่านที่ทำการเลี้ยงไก่ หรือ ทำงานที่เกี่ยวข้องกับผลิตภัณฑ์ต่างๆของไก่ ได้รับการตรวจร่างกายทุกปี			
48. ถ้าท่านพบการตายอย่างไม่ทราบสาเหตุของไก่ที่ท่านซื้อระหว่างขนส่ง ท่านจะแจ้งเจ้าหน้าที่กรมปศุสัตว์			

บทบาทผู้บริโภค

ภายในแบบสอบถามประกอบไปด้วย 2 ส่วน ดังนี้

<u>ส่วนที่ 1 แบบสัมภาษณ์ผู้บริโภคสำหรับการประเมินความเสี่ยงของเชื้อไข้หวัดนกชนิดรุนแรง (H5N1)ในเส้นทางการตลาดไก่ไข่ ณ ตำบล บ้านกลาง อำเภอ เมืองนครพนม จังหวัด นครพนม ยประเทศไท</u>

1. ท่านได้ทำการซื้อผลิตภัณฑ์สัตว์ปีกชนิดใดบ้าง? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ สัตว์ปีกมีชีวิต □ สัตว์ปีกตายแล้ว □ สัตว์ปีกที่ผ่านการชำแหละแล้ว

□ ซากไก่ □ ไข่ไก่

2. ท่านซื้อผลิตภัณฑ์สัตว์ปีกนั้นๆจากแหล่งใด? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ ฟาร์ม …… □ ผู้ค้าคนกลาง……

□ โรงเชือดสถานที่ชำแหละ /……..□ ตลาด……..

□ อื่นๆ .....(ระบุ)

3. เหตุผลใดที่ท่านเลือกซื้อจากแหล่งขายนั้นๆ(เลือกตอบเหตุผลที่มีอิทธิพลต่อท่านมากที่สุด)

□ ราคา □ ความสนิทสนม □ ความสะดวก □ อื่นๆ (ระบุ)……

4. โดยปกติ ท่านได้ทำการซื้อผลิตภัณฑ์สัตว์ปีกจำนวนเท่าใด ในแต่ละครั้งของการซื้อสินค้า?.

.....

5. ท่านได้รับสินค้าโดยวิธีการใด?

□ ขนส่งโดยเจ้าของฟาร์ม..... □ ขนส่งโดยพ่อค้าคนกลาง……

□ ขนส่งโดยผู้ชำแหละ.... ……. □ ท่านทำการขนส่งเอง จาก……

□ อื่นๆ (ระบุ)……...

6. ท่านได้มีการใช้บรรจุภัณฑ์ เช่น กรง ของท่านเองในการซื้อสินค้าหรือ ไม่?

□ ใช้ □ ไม่ใช้

7. บรรจุภัณฑ์ที่ใช้ทำจากวัสดุชนิดใด?

□ พลาสติก □ เหล็กอะลูมิเนียม/ □ ไม้ □ อื่นๆ (ระบุ)……

8. ถ้าท่านมีการซื้อสัตว์ปีกมีชีวิตมาเพื่อบริโภค ท่านจะทำการเชือดเอง หรือ ไม่?

□ ใช่ □ไม่ใช่ เชือดโดย……(ข้ามไปยังคำถาม ส่วนที่2)

9. ถ้าท่านได้ทำการเชือดสัตว์ปีกเอง ท่านมีวิธีกำจัดซากสัตว์ปีกอย่างไร?

□ ฝัง □ เผา □ ให้เป็นอาหารแก่สัตว์อื่น

□ ทิ้งลงถังขยะ □ อื่นๆ (ระบุ)…….

10. ถ้าท่านได้ทำการเชือดสัตว์ปีกเองท่านได้ใช้แหล่งน้ำใดในการทำความสะอาดบริเวณ ชำแหละ?

□ จากแม่น้ำ □ น้ำบาดาล □ อื่นๆ .....(ระบุ)

<u>ส่วนที่ 2 แบบ สัมภาษณ์บทบาทผู้บริโภค สำหรับ ความรู้ ทัศนคติ และการปฏิบัติที่เกี่ยวข้องกับการป้องกัน และควบคุมโรคไข้หวัดนกในฟาร์มไก่ไข่ ณ ตำบล บ้านกลาง อำเภอ เมืองนครพนม จังหวัดนครพนม ประเทศไทย</u>

ข้อมูลเบื้องต้น

1. ท่านเคยได้รับการฝึกอบรม เข้าร่วม หรือ เป็นส่วนหนึ่งของกิจกรรมที่ให้ความรู้ ความเข้าใจเกี่ยวกับเชื้อไข้หวัดนก หรือ ไม่?

□ เคย เมื่อ…….โดย……..

□ ไม่เคย

2. ท่านเคยได้รับประสบการณ์ตรงที่เกี่ยวข้องกับโรคไข้หวัดนก หรือ ไม่?

□ เคย จาก

□ สัตว์เลี้ยงของท่านเคยได้รับการสงสัยว่ามีการติดเชื้อไข้หวัดนก

□ สมาชิกภายในครอบครัวได้รับการสงสัยว่าติดเชื้อไข้หวัดนก

□ ไม่เคย

ส่วน 2.1ความรู้ ความเข้าใจ

1. โรคไข้หวัดนกเกิดจากเชื้อชนิดใด?

□ ไวรัส □ แบคทีเรีย □ ปรสิต □ ไม่ทราบ

2. สัตว์ชนิดใดบ้างที่สามารถติดเชื้อไข้หวัดนก? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ เฉพาะไก่ □ สัตว์ปีกทุกชนิด □ สัตว์เลี้ยงลูกด้วยนม □ ไม่ทราบ

3. ลักษณะ และ อาการแสดงหลัก ในสัตว์ปีกที่ติดเชื้อไข้หวัดนกชนิดรุนแรง (H5N1) ได้แก่?

□ ซึม ขนยับและยุ่ง บริเวณเหนียง หงอน คอและเท้าบวม และมีสีเขียว เบื่ออาหาร ไอ ท้องร่วง ตายเฉียบพลันโดยไม่มีอาการแสดงเตือนล่วงหน้า

□ ซึม ถ่ายเหลวเป็นสีเขียว จาม ปีกตก กล้ามเนื้อสั่น รอบๆเนื้อเยื่อบริเวณตาและคอมีอาการบวม

□ ไม่ทราบ

4. มีวิธีรักษาสัตว์ปีกที่ติดเชื้อไข้หวัดนกชนิดรุนแรง หรือ ไม่?

□ มี □ ไม่มี □ ไม่ทราบ

5. เชื้อไข้หวัดนกสามารถติดต่อผ่านทางใดได้บ้างระหว่างสัตว์(สามารถตอบได้มากกว่า 1 คำตอบ)

□ จากการสัมผัสโดยตรงกับสัตว์ปีกที่ติดเชื้อ หรือ สัตว์ที่ติดเชื้อ

□ จากการสัมผัสโดยตรงกับไก่ตายที่สงสัยว่าติดเชื้อ และรับประทานเนื้อดิบ หรือ ปรุงไม่สุกจากไก่ตายนั้นๆ

□ จากการสัมผัสโดยตรงกับสิ่งคัดหลั่ง ได้แก่ อุจจาระ เยื่อเมือก น้ำลาย และน้ำตาจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ จากการสัมผัสกับยานพาหนะ เครื่องมือ หรือ อุปกรณ์ เช่น กรง สุ่ม หรือ ถาดไข่ ที่มีการปนเปื้อนสิ่งคัดหลั่งจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ ไม่ทราบ

6. ท่านคิดว่า เชื้อไข้หวัดนกสามารถแพร่ผ่านทางไข่ได้หรือไม่?

□ ได้ □ ไม่ได้ □ ไม่ทราบ

7. ท่านคิดว่า เชื้อไข้หวัดนกสามารถติดต่อจากสัตว์ หรือ นกพาหะ สู่คนได้ หรือ ไม่?

□ ได้ □ ไม่ได้ □ ไม่ทราบ

8. ท่านคิดว่า เชื้อไข้หวัดนกสามารถติดต่อระหว่างคนสู่คนได้ หรือ ไม่?

□ ได้ เพราะ……□ไม่ได้ เพราะ…….....□ ไม่ทราบ

9. คนสามารถติดเชื้อไข้หวัดนกได้อย่างไร?

□ จากการสัมผัสโดยตรงกับสัตว์ปีกที่ติดเชื้อ หรือ สัตว์ที่ติดเชื้อ

□ จากการสัมผัสโดยตรงกับไก่ตายที่สงสัยว่าติดเชื้อ และรับประทานเนื้อดิบ หรือ ปรุงไม่สุกจากไก่ตายนั้นๆ

□ จากการสัมผัสโดยตรงกับสิ่งคัดหลั่ง ได้แก่ อุจจาระ เยื่อเมือก น้ำลาย และน้ำตาจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ จากการสัมผัสกับยานพาหนะ เครื่องมือ หรือ อุปกรณ์ เช่น กรง สุ่ม หรือ ถาดไข่ ที่มีการปนเปื้อนสิ่งคัดหลั่งจากสัตว์ที่ติดเชื้อ หรือ นกพาหะ

□ ไม่ทราบ

10. ลักษณะ และ อาการแสดงหลัก ที่พบได้ในคนที่สงสัยว่าติดเชื้อไข้หวัดนกชนิดรุนแรง (H5N1) ได้แก่?

□ ไข้สูง ปวดหัว ไอ จาม เจ็บคอ ปวดกล้ามเนื้อ หายใจลำบาก

□ ตัวเหลือง อ่อนเพลีย เบื่ออาหาร ซึม

□ ไม่ทราบ

11. พฤติกรรมใดที่จัดว่ามีความเสี่ยงสูงต่อการได้รับเชื้อไข้หวัดนกมาสู่คน?

□ รับประทานเนื้อดิบ หรือ ปรุงไม่สุก ที่ได้จากสัตว์ปีกป่วย

□ รับประทานไข่ดิบ

□ ทั้งสองอย่าง

□ ไม่ทราบ

12. ท่านคิดว่าโรคไข้หวัดนกมีผลกระทบต่อชุมชนที่มีการเลี้ยงไก่ อย่างไรบ้าง?

□ เกิดอัตราการตายสูงในเฉพาะไก่

□ เกิดอัตราการตายสูงในสัตว์ปีกทั้งหมด

□ เกิดอัตราการตายสูงในสัตว์ปีก และสามารถติดเชื้อไปยังสัตว์อื่นๆ แต่ไม่สามารถติดต่อสู่คนได้

□ เกิดอัตราการตายสูงในสัตว์ปีก สามารถติดเชื้อไปยังสัตว์อื่นๆ และสามารถติดต่อสู่คนได้

13. ใครเป็นผู้ที่มีความไวต่อการได้รับเชื้อไข้หวัดนก ภายในบริเวณพื้นที่ที่มีการปนเปื้อนของเชื้อ?

□ เด็ก □ ผู้ใหญ่ □ผู้สูงอายุ □ เด็กและผู้สูงอายุ

14. บทบาทใดในเส้นทางการตลาดสัตว์ปีกที่จัดว่ามีความเสี่ยงสูงในการติดเชื้อ และ แพร่กระจายเชื้อไข้หวัดนก? (สามารถตอบได้มากกว่า 1 คำตอบ)

□ เกษตรกร □ ผู้รวบรวมสินค้า, พ่อค้าขายส่ง, พ่อค้าขายปลีก

□ ธุรกิจที่เกี่ยวข้องกับสัตว์ปีกมีชีวิต□ ธุรกิจที่เกี่ยวข้องกับผลิตภัณฑ์สัตว์ปีก

□ ผู้บริโภค □ อื่นๆ (ระบุ).....

ส่วนที่ ทัศนคติ 2.2

	เห็นด้วย/ พึงพอใจ	ไม่เห็นด้วย/ ไม่พอใจ	ไม่แน่ใจ
15. โรคไข้หวัดนกเป็นโรคที่ป้องกันได้			
16. ไก่ที่ติดเชื้อไข้หวัดนกไม่สามารถทำการรักษาได้			
17. ผู้ป่วยที่ติดเชื้อไข้หวัดนกไม่สามารถทำการรักษาได้			
18. เชื้อไข้หวัดนกเป็นเชื้อที่ก่อให้เกิดโรคร้ายแรง เพราะเชื้อสามารถเปลี่ยนแปลงพันธุกรรม ซึ่งก่อให้เกิดการระบาด			

ร้ายแรงภายในคนได้			
19. นกเป็ดน้ำ เป็น แหล่งสะสมเชื้อไข้หวัดนกที่สำคัญ			
20. สัตว์ที่ติดเชื้อจะสามารถทำการขับเชื้อไวรัส ไข้หวัดนกออกมาได้ ถึงแม้จะไม่มีอาการแสดงใดๆ			
21. การสัมผัสโดยตรงกับไก่ป่วยเป็นการเพิ่มความเสี่ยงในการติดเชื้อไข้หวัดนก			
22. การรับประทานเนื้อดิบ หรือ ปรุงไม่สุกที่ได้รับจากไก่ป่วย เป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
23. การรับประทานไข่ดิบจากแหล่งที่มีการปนเปื้อนเชื้อไข้หวัดนก เป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
24. การใช้ยานพาหนะเดียวกันในการขนส่งระหว่างสัตว์ปีกและคน เป็นการเพิ่มความเสี่ยงต่อการติดเชื้อไข้หวัดนก			
25. อุปกรณ์เสื้อผ้า ที่มีการ ,รองเท้าบูท ,ถุงอาหารพลาสติก , กรง , ชื้อไข้หวัดนกสามารถก่อให้เกิดการแพร่กระจายปนเปื้อนของเ ของเชื้อไข้หวัดนกได้			
26. สัตว์ที่ติดเชื้อสามารถขับเชื้อไข้หวัดนกได้โดยเฉพาะทางสิ่งคัดหลั่ง เช่น อุจจาระ น้ำลาย เยื่อเมือก หรือ เลือด			
27. บุคคลที่ทำงานเกี่ยวข้องกับสัตว์ปีก หรือ ผลิตภัณฑ์ที่ได้รับจากสัตว์ปีกมีความเสี่ยงในการได้รับเชื้อไข้หวัดนกสูงกว่าบุคคลทั่วไป			
28. ถ้าพบอาการแสดง ได้แก่ ไข้สูง หนาวสั่น เจ็บคอ หายใจลำบาก ในสมาชิกภายในครอบครัว บุคคลเหล่านี้ควรรีบไปพบแพทย์ทันที			
29. การใช้น้ำยาฆ่าเชื้อ หรือ สบู่ ในการทำความสะอาดเครื่องมืออุปกรณ์ กรง เสื้อผ้า ฯลณ สามารถป้องกันการติดเชื้อ และแพร่กระจายของเชื้อไข้หวัดนกได้			
30. ท่านจัดว่าเป็นกลุ่มบุคคลที่มีความเสี่ยงในการติดเชื้อไข้หวัดนกสูง			
31. ถ้าท่านพบว่า สัตว์ปีกที่ท่านซื้อมาจากแหล่งขายสงสัยว่าติดเชื้อไข้หวัดนก ท่านจะต้องแจ้งเจ้าหน้าที่กรมปศุสัตว์			
32. ท่านคิดว่าพื้นที่ บริเวณ ตำบลบ้านกลาง มีความเสี่ยงในการเกิดโรคไข้หวัดนกซ้ำ หรือ ไม่?			
33. ท่านคิดว่าพื้นที่ บริเวณ ตำบลบ้านกลาง ควรจะมีระบบที่ดีในการเฝ้าระวังการเกิดโรคซึ่งเกิดจากการร่วมมือของชุมชนในการป้องกันการเกิดอุบัติการณ์ซ้ำของโรคไข้หวัดนก หรือ ไม่?			

ส่วนที่ 2.3การปฏิบัติ

	ตลอดเวลา	บางครั้ง	ไม่เคยปฏิบัติ
** หากท่านไม่ได้ทำการชำแหละไก่เอง ข้ามไปตอบยังข้อ 37**			
34. ท่านมีการป้องกันตัวเองที่เหมาะสมก่อนทำการสัมผัสไก่ป่วย			

หรือ ตาย โดยการ สวมใส่อุปกรณ์ป้องกันตัวเอง เช่น หน้ากาก ถุงมือ ผ้ากันเปื้อน และรองเท้าบูท			
35. ท่านจะทำการล้างมือ และ เครื่องมือต่างๆที่ถูกใช้เกี่ยวข้องกับไก่ ภายหลังการปฏิบัติงาน			
36. ท่านมีการใช้สบู่ หรือ น้ำยาฆ่าเชื้อ เพื่อทำความสะอาดมือ และเครื่องมือต่างๆ ภายหลังการปฏิบัติงาน			
37. ท่านบริโภคไก่ที่ปรุงสุก และ ไข่ที่ปรุงสุก			
38. ถ้าพบว่าสมาชิกภายในครอบครัวมีอาการแสดงคล้ายเป็นไข้หวัด ท่านจะรีบพาไปพบแพทย์			
39. ถ้าพบสัตว์ปีกสงสัยว่าติดเชื้อไข้หวัดนก ท่านจะทำการแจ้งไปยังเจ้าหน้าที่กรมปศุสัตว์			

APPENDIX II

Verbal consent to participate in a research project

Colorado State University

My name is Ms. Patchara Limhapirom and I am a researcher from the Clinical Science Department, Colorado State University, USA. I am conducting a research project under the guidance of Dr. Mo Salman. The project is investigating the flow of poultry in the market chain and at what points the risks are greater for transmission or spread of Avian Influenza from the farms to consumers.

You can provide valuable information for this study by answering several questions regarding your normal operation of your work and knowledge, attitude and practice of Avian Influenza. This activity will take approximately 30 minutes. If you do not understand a question or any part of the study process, you can ask me until you are satisfied that you understand.

Your participation in this research is voluntary. You can stop participating in the study at any time. If you decide not to participate, it will not affect you in any way. While participating in this study will give no direct benefits to you, we hope to gain information that will benefit your community in the future.

The information you give will be combined with information from other people taking part in the study. You will not be identified in these written materials. We may publish the results of this study. Throughout the study all of your information will be kept private. At the end of the study your information may be shown to certain persons or institutes, but only for academic purposes.

It is not possible to identify all potential risks in research procedures, but I have taken reasonable safeguards to minimize any known or potential risks.

Therefore, do you wish to participate this study?

□ If yes, let's begin from answering several questions which are included both closed-ended and open-ended questions.

□ If no, thank you for your time, have a nice day.

แบบพูดแสดงเจตนายินยอมเข้าร่วมการวิจัย
ของมหาวิทยาลัย โคโลราโด ประเทศ สหรัฐอเมริกา

ข้าพเจ้า สพญ .พัชร ลิ้มหภิรมย์ นักศึกษา ปริญญาโท จาก คณะวิทยาศาสตร์การแพทย์ มหาวิทยาลัย โคโลราโด ประเทศ สหรัฐอเมริกา เป็นผู้ดำเนินการวิจัยภายใต้คำแนะนำจาก ดร .โม แซลแมน ภายใต้หัวข้อการวิจัย เรื่อง การวิเคราะห์เส้นทางการตลาดสัตว์ปีกจากผู้ผลิตถึงผู้บริโภค และการจัดการความเสี่ยงโรคไข้หวัดนกในเส้นทางการตลาดสัตว์ปีกโดยใช้วิธีความร่วมมือจากชุมชนเป็นฐาน

ข้าพเจ้าจึงใคร่ขอความร่วมมือจากเกษตรกรผู้เลี้ยงไก่ในการให้ข้อมูลเพื่อทำการวิจัยในครั้งนี้ เนื่องด้วยท่านจัดอยู่ในบทบาทหนึ่งในเส้นทางการตลาดของสัตว์ปีกที่มีความสำคัญในการให้ข้อมูลเพื่อทำการศึกษาวิจัยครั้งนี้ ผู้ดำเนินงานวิจัยจะทำการสัมภาษณ์คำถาม จากแบบสอบถามที่เกี่ยวข้องกับบทบาทของท่านในเส้นทางการตลาดสัตว์ปีก โดยการสัมภาษณ์จะใช้ระยะเวลาประมาณ 30 นาที หากท่านมีข้อข้องใจเกี่ยวข้องกับคำถาม หรือขั้นตอนของการวิจัย ท่านสามารถทำการข้าพเจ้าได้จนกว่าท่านพึงพอใจ

เนื่องด้วยการเข้าร่วมงานวิจัยในครั้งนี้ของท่านเป็นการเข้าร่วมตามความสมัครใจ ท่านสามารถถอนตัวหรืองดเข้าร่วมการวิจัยได้ทุกเมื่อโดยจะไม่มีผลกระทบใดๆต่อท่านทั้งสิ้น ถึงแม้ว่าท่านจะไม่ได้รับผลประโยชน์โดยตรงจากงานวิจัยนี้ แต่ผู้ดำเนินงานวิจัยหวังว่า ผลจากงานวิจัยครั้งนี้ จะสามารถก่อให้เกิดประโยชน์ในภายภาคหน้าแก่ชุมชนของท่าน

ในการวิจัยนี้ ผู้ดำเนินงานวิจัยจะทำการรวมข้อมูลที่ได้จากท่านกับข้อมูลของผู้ตอบแบบสัมภาษณ์ท่านอื่นในบทบาทเดียวกันของเส้นทางการตลาดสัตว์ปีก โดยผู้ดำเนินงานวิจัยจะทำการเผยแพร่ หรือ ตีพิมพ์เฉพาะลักษณะข้อมูลที่ผ่านการวิเคราะห์เรียบร้อยแล้ว ชื่อและข้อมูลส่วนตัวของท่านจะถูกเก็บไว้เป็นความลับ แต่อาจจะทำการเปิดเผยได้ต่อบุคคล หรือ หน่วยงานอื่นๆ เฉพาะในกรณีเพื่อการศึกษาเท่านั้น

ถึงแม้ว่า ผู้ดำเนินงานวิจัยไม่สามารถคาดการณ์ความเสี่ยง หรือ ปัญหาต่างๆที่อาจเกิดขึ้นในระหว่างการดำเนินขั้นตอนงานวิจัย อย่างไรก็ตาม ทางผู้ดำเนินงานวิจัยก็ได้เตรียมแนวทางรองรับสถานการณ์ดังกล่าวไว้แล้ว

ดังนั้น ท่านมีความประสงค์ที่จะเข้าร่วมงานวิจัยครั้งนี้หรือไม่

□ใช่ ข้าพเจ้ามีความประสงค์ที่จะเข้าร่วมในงานวิจัยครั้งนี้ ซึ่งผู้ดำเนินงานวิจัยจะเริ่มทำการสัมภาษณ์แบบสอบถามที่ประกอบไปด้วยคำถามลักษณะปลายเปิด และปลายปิด

□ไม่ใช่ ข้าพเจ้าไม่ต้องการเข้าร่วม งานวิจัยครั้งนี้ อย่างไรก็ตามผู้ดำเนินงานวิจัยขอขอบพระคุณที่ท่านสละเวลาให้

Verbal consent to participate in a research project

Colorado State University

My name is Ms. Patchara Limhapirom and I am a researcher from the Clinical Science Department, Colorado State University, USA. I am conducting a research project under the guidance of Dr. Mo Salman. The project is investigating the flow of poultry in the market chain and at what points the risks are greater for transmission or spread of Avian Influenza from the farms to consumers.

You are invited to be in a group discussion with other people to provide valuable information on your knowledge, attitude and practices toward controlling the Avian Influenza. This discussion will take approximately 2 hours. If you do not understand a question or any part of the study process, you can ask me until you are satisfied that you understand.

Your participation in this research is voluntary. You can stop participating in the study at any time. If you decide not to participate, it will not affect you in any way. We will pay $7 cash to you for your participation.

We will collect information by taking notes and using a tape recorder. The information you give will be combined with information from other people taking part in the study. You will not be identified in these materials. We may publish the results of this study, but your name will not be included. Throughout the study all of your information will be kept private. At the end of the study your information may be shown to certain persons or institutes, but only for academic purposes.

It is not possible to identify all potential risks in research procedures, but I have taken reasonable safeguards to minimize any known or potential risks.

Therefore, do you wish to participate in this study?

□ If yes, I will announce the date, time and place of meeting at a later time.

□ If no, Thank you for your time. Have a nice day

แบบพูดแสดงเจตนายินยอมเข้าร่วมการวิจัยของมหาวิทยาลัย โคโลราโด ประเทศ สหรัฐอเมริกา

ข้าพเจ้า สพญ .พัชร ลิ้มหภิรมย์ นักศึกษา ปริญญาโท จาก คณะวิทยาศาสตร์การแพทย์ มหาวิทยาลัย โคโลราโด ประเทศ สหรัฐอเมริกา เป็นผู้ดำเนินการวิจัยภายใต้คำแนะนำจาก ดร .โม แซลแมน ภายใต้หัวข้อการวิจัย เรื่อง การวิเคราะห์เส้นทางการตลาดสัตว์ปีกจากผู้ผลิตถึงผู้บริโภค และการจัดการความเสี่ยงโรคไข้หวัดนกในเส้นทางการตลาดสัตว์ปีกโดยใช้วิธีความร่วมมือจาก ชุมชนเป็นฐาน

ข้าพเจ้าจึงใคร่ขอความร่วมมือจากพ่อค้าคนกลางในการให้ข้อมูลเพื่อทำการวิจัยในครั้งนี้ เนื่องด้วยท่านจัดอยู่ในบทบาทหนึ่งในเส้นทางการตลาดของสัตว์ปีกที่มีความสำคัญในการให้ข้อมูล เพื่อทำการศึกษาวิจัยครั้งนี้ ผู้ดำเนินงานวิจัยจะทำการประชุมกลุ่มย่อยภายใต้หัวข้อคำถามที่เกี่ยวข้องกับ ความรู้ ความเข้าใจ ทัศนคติและการปฏิบัติตนของท่านที่เกี่ยวข้องกับโรคไข้หวัดนก โดยการประชุมจะใช้ระยะเวลารวมทั้งสิ้นประมาณ 2 ชั่วโมง หากท่านมีข้อข้องใจเกี่ยวข้องกับคำถาม หรือขั้นตอนของการวิจัย ท่านสามารถทำการข้าพเจ้าได้จนกว่าท่านพึงพอใจ

เนื่องด้วยการเข้าร่วมงานวิจัยในครั้งนี้ของท่านเป็นการเข้าร่วมตามความสมัครใจ ท่านสามารถถอนตัวหรืองดเข้าร่วมการวิจัยได้ทุกเมื่อโดยจะไม่มีผลกระทบใดๆต่อท่านทั้งสิ้น หากท่านเข้าร่วมในการประชุมกลุ่มย่อยครั้งนี้ ทางผู้ดำเนินงานวิจัยจะมี ค่าตอบแทนมูลค่า 200 บาท ให้กับท่าน

ผู้ดำเนินงานวิจัยจะใช้การจดบันทึก และ บันทึกเสียง ในการเก็บข้อมูลวิจัยนี้ ผู้ดำเนินงานวิจัยจะทำการรวมข้อมูลที่ได้จากท่านกับข้อมูลของผู้เข้าร่วมประชุมท่านอื่นในบทบาทเดียวกันของเส้นทางการตลาดสัตว์ปีก โดยผู้ดำเนินงานวิจัยจะทำการเผยแพร่ หรือ ตีพิมพ์เฉพาะลักษณะข้อมูล

ที่ผ่านการวิเคราะห์เรียบร้อยแล้ว ชื่อและข้อมูลส่วนตัวของท่านจะถูกเก็บไว้เป็นความลับ แต่อาจจะทำการเปิดเผยได้ต่อบุคคล หรือ หน่วยงานอื่นๆ เฉพาะในกรณีเพื่อการศึกษาเท่านั้น

ถึงแม้ว่า ผู้ดำเนินงานวิจัยไม่สามารถคาดการณ์ความเสี่ยง หรือ ปัญหาต่างๆที่อาจเกิดขึ้นในระหว่างการดำเนินขั้นตอนงานวิจัย อย่างไรก็ตาม ทางผู้ดำเนินงานวิจัยก็ได้เตรียมแนวทางรองรับสถานการณ์ดังกล่าวไว้แล้ว

ดังนั้น ท่านมีความประสงค์ที่จะเข้าร่วมงานวิจัยครั้งนี้หรือไม่

□ใช่ ข้าพเจ้ามีความประสงค์ที่จะเข้าร่วมในงานวิจัยครั้งนี้ ซึ่งผู้ดำเนินงานวิจัยจะทำการแจ้ง วัน เวลา และสถานที่การประชุมให้ท่านทราบในโอกาสต่อไป

□ไม่ใช่ ข้าพเจ้าไม่ต้องการเข้าร่วมในงานวิจัยครั้งนี้ อย่างไรก็ตามผู้ดำเนินงานวิจัยขอขอบพระคุณที่ท่านสละเวลาให้

APPENDIX III

Focus discussion group guide

Theme

- **Disease-related issues**

1. Knowledge, attitude, and perception of Avian Influenza (AI)
    a. What is AI?
    b. What causes AI?
    c. What animals can be infected with AI?
    d. What are transmission modes of AI?
    e. What did you do when you heard about AI? Why?
    f. Are you afraid of AI? Why?
    g. Do you think your group is at risk for infection with AI? Why?
    h. Do you think AI in your community is gone, present, or will come again?

- **Control-related issues**

2. Measures taken during the recent outbreak
    a. What information was given to people in the community?
    b. What did you, as an actor in the market chain, do during the recent outbreak of AI to cope with the situation? Why?
    c. What did your community do during the recent outbreak of AI to cope with the outbreak? Why? What were the results?
    d. What support did you receive from local authorities during the outbreak (education, compensation, and other types of support)?

e. Was the support appropriate and relevant to the situation?

- **Community participation-related issues**

3. Surveillance

   a. Who are the trusted/authoritative voices specifically on AI-related issues?

   b. What are the motivations and barriers for people to implement the actions?

   c. What are the reactions of the community and suggestions regarding specific interventions for AI prevention?

แนวทางการประชุมกลุ่มย่อย

แนวความคิด

- **หัวข้อคำถามที่เกี่ยวข้องกับโรคไข้หวัดนก**

1. ความรู้ ความเข้าใจ และ ทัศนคติ เกี่ยวกับโรคไข้หวัดนก

   1.1 โรคไข้หวัดนก คือ อะไร

   1.2โรคไข้หวัดนก เกิดจาก สาเหตุใด

   1.3สัตว์ชนิดใดบ้างที่สามารถติดเชื้อไข้หวัดนก

   1.4โรคไข้หวัดนกสามารถติดต่อผ่านทางช่องทางใดได้บ้าง

   1.5ท่านได้มีการปฏิบัติตัวอย่างไรบ้างเมื่อทราบข่าวเกี่ยวกับการตรวจพบ หรือ มีการระบาดของโรคไข้หวัดนก เพราะสาเหตุใด

   1.6ท่านคิดว่าโรคไข้หวัดนกน่ากลัวหรือไม่ เพราะเหตุใด

   1.7ท่านคิดว่า ท่านเป็นกลุ่มที่มีความเสี่ยงในการติดเชื้อไข้หวัดนกหรือไม่ เพราะเหตุผลใด

   1.8ท่านคิดว่าสถานการณ์ไข้หวัดนกในชุมชนของท่านเป็นอย่างไร (ไม่มีโอกาสกลับมาเป็นซ้ำ, มีโอกาสกลับมาเกิดโรคซ้ำ)

- **หัวข้อคำถามที่เกี่ยวข้องกับการควบคุมและป้องกันโรคไข้หวัดนก**

2. การปฏิบัติที่เกี่ยวข้องในช่วงที่มีการระบาดของโรคไข้หวัดนก

   2.1ชุมชนของท่านได้รับข้อมูลข่าวสารที่เกี่ยวข้องกับโรคไข้หวัดนกอย่างไร

   2.2ในฐานะที่ท่านเป็นบทบาทส่วนหนึ่งในเส้นทางการตลาดไก่ไข่ ท่านได้ปฏิบัติอย่างไรบ้างในช่วงที่มีการระบาดของเชื้อไข้หวัดนก เพราะอะไร

2.3ชุมชนของท่านได้มีมาตรการควบคุมสถานการณ์อย่างไรบ้างในช่วงที่มีการระบาดของเชื้อไข้หวัดนก เพราะอะไร และผลลัพธ์เป็นอย่างไรบ้าง

2.4ท่านได้รับความช่วยเหลือจากการระบาดของเชื้อไข้หวัดนกทางใด อย่างไรบ้าง (จากหน่วยงานต่างๆภายในพื้นที่ที่เกี่ยวข้อง การให้ความรู้ ,ค่าชดเชย และลักษณะความช่วยเหลือในรูปแบบอื่นๆ)

2.5ท่านมีความคิดเห็นอย่างไรบ้างกับความช่วยเหลือนั้นๆ (ท่านคิดว่า มีความเหมาะสมและสอดคล้องกับ สถานการณ์ที่เกิดขึ้นหรือ ไม่ มากน้อยเพียงใด)

- **หัวข้อคำถามที่เกี่ยวข้องกับความร่วมมือจากชุมชน**

3 การเฝ้าระวังโรคไข้หวัดนก

3.1บุคคลใด หรือ หน่วยงานใดที่มีความน่าเชื่อถือ ในการแจ้ง ประชาสัมพันธ์ข่าวสาร ความรู้ต่างๆที่เกี่ยวข้องกับสถานการณ์ หรือ โรคไข้หวัดนก ให้กับชุมชนของท่าน

3.2ท่านคิดว่า อะไรคือ แรงจูงใจ หรือ อุปสรรคสำหรับคนในชุมชนของท่าน เข้ามามีส่วนร่วมในการดำเนินการต่างๆของส่วนรวม

3.3ชุมชนของท่านมีการตอบสนองในส่วนของ การให้ความร่วมมือ คำแนะนำต่างๆที่เกี่ยวข้องกับการป้องกัน และควบคุม โรคไข้หวัดนกอย่างไรบ้าง