



CENTER FOR AGRICULTURAL POLICY

Policy Analysis of HPAI Strategy Including Analysis of Collaboration and Partnership Between Public and Private Sectors

Gathering Evidence for a Transitional
Strategy (GETS) for HPAI H5N1
Vaccination in Vietnam

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Gathering Evidence for a Transitional Strategy (GETS) for
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February 15th 2011

LIST OF ABBREVIATIONS

AI	Avian Influenza
AVET	Applied Veterinary Epidemiology Training
CAP	Center for Agricultural Policy
DAH	Department of Animal Health
DARD	Department of Agriculture and Rural Development
DVS	District Veterinary Services
FAO	Food and Agriculture Organization
GETS	Gathering Evidence for a Transitional Strategy
HPAI	Highly Pathogenic Avian Influenza
MARD	Ministry of Agriculture and Rural Development
MOH	Ministry of Health
NCAICP	National Committee for Avian Influenza Disease Control and Prevention
NSCAI	National Steering Committee for Human and Avian Influenza among Humans
OIE	World Organization for Animal Health
PM/DPM	Prime Minister/Deputy Prime Minister
PPC	Provincial People Committee
SCAP	Sothern Center for Agricultural Policy
VND	Vietnamese Dong
WHO	World Health Organization

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INTRODUCTION

Avian Influenza (AI) viruses occur naturally among wild birds and generally cause minor symptoms from which the birds rapidly recover. However, one of its strain, Highly Pathogenic Avian Influenza (HPAI) type A sub-type H5N1, is extremely infectious, causes severe illness, and mortality rates often reaching 90 - 100 percent in domesticated poultry within 48 hours. HPAI A(H5N1) has received considerable concerns of international community due to its possibility to mutate into a form that could spread between human and cause global pandemic - since 1997, studies of H5N1 influenza indicate that these viruses continue to evolve. The global spread of HPAI A(H5N1) in birds is considered a significant pandemic threat. The strain of AI virus has infected and killed birds and humans in South East Asia, Africa and Europe since late 2003. Tens of millions of birds have died and hundreds of millions of birds have been slaughtered and disposed of, to limit the spread of H5N1. From 2003 to November 19th 2010 there have been a total of 508 confirmed cases in humans resulting in 302 deaths (59 percent mortality rate) (WHO, 2010).

As a country suffering from large-scale AI outbreaks and receiving considerable international support, Vietnam provides a crucial case not to be missed in any analysis of the global AI crisis (Vu). The disease has caused serious impacts on the country poultry industry, left behind heavily consequences with respect to economic and social. From December 2003 to June 2007, 50 millions of birds have died and disposed of, damage up to thousands of billions VND. From 2003 to November 19th 2010 there have been a total of 119 confirmed cases in humans resulting in 59 deaths (50 percent mortality rate) (WHO, 2010).

Vietnam has practicing a range of prevention and control measures especially mass vaccination of poultry, twice yearly in October and April with some considerable empirical evidence of success. However, it has been recognized that the prevention and control strategies (or the way implementing the measures) is not sustainable over the whole country in the long term. Therefore, an alternative or more likely many alternatives prevention and control strategies will have to be devised as Vietnam moves from initial emergency measures to a period of consolidation and ultimately on the stated aim of AI control/eradication beyond 2010. This study is one of components of a project that aims to provide field data by testing a number of alternative strategies including differing vaccination strategies and the complimentary strategy of improved surveillance. It focuses on policy analysis of HPAI strategy including public private sector collaboration and partnership.

The main objectives of the study are to identify policy and institutional framework for HPAI prevention and control, understand its effectiveness and propose necessary changes based on governance analysis of the poultry industry.

I. METHODOLOGY AND LIMITATIONS

I.1. Methodology

The main methodology approach is desk study with critical review of major characteristics of HPAI disease in Vietnam, policy and institutional framework for HPAI prevention and control, poultry value chain and its governance finally effectiveness of HPAI control policy towards changing tendency and behavior of poultry actors through secondary sources of information, data and research reports.

I.2. Limitations

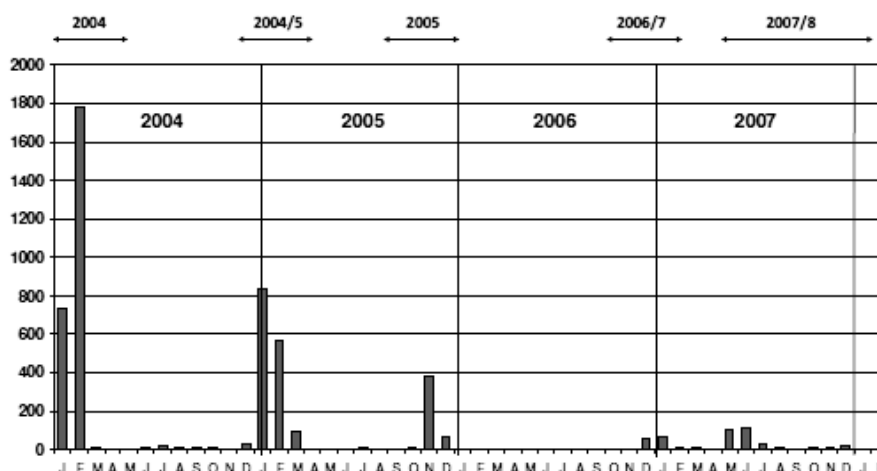
The limitations of the study appear from the fact that we mainly use secondary sources of information, data and research reports as material for writing our paper. The following are research topics that are missing or just briefly mention in our available researches/studies collection:

- Governance analysis requires understanding rules, regulations and standards whatever those are official "legal" rules or norms of trade or voluntary standards. Official "legal" rules set up by government are available but specific norms of trade or voluntary standards that are agreements between participants in the value chain are almost not available.
- A range of HPAI prevention and control measures has been implemented to combat the disease. However, assessments on effectiveness relates to each measure as well as proposals on alternative strategies are still limited, except for vaccination.

II. MAJOR CHARACTERISTICS OF HPAI DISEASE IN VIETNAM

The source of HPAI A(H5N1) in Viet Nam is unknown, but it is suspected that infection might have originated from reservoirs of infection in wild water birds or illegal imports of infected poultry from neighboring countries. Epidemic waves occurred in similar geographic locations with major foci being the Mekong and the Red River deltas (S. Burgos, J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst, 2008). Spread of HPAI disease in Vietnam is believed to occur through mechanisms such as scavenging of domestic poultry, via transport of birds and movement of people. Since mid-November 2003, three major HPAI outbreak epidemic waves have occurred (2004, 2004/05, and 2005) in poultry followed by two minor ones in 2006 and 2007 (S. Burgos, J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst, 2008). See Figure II-1.

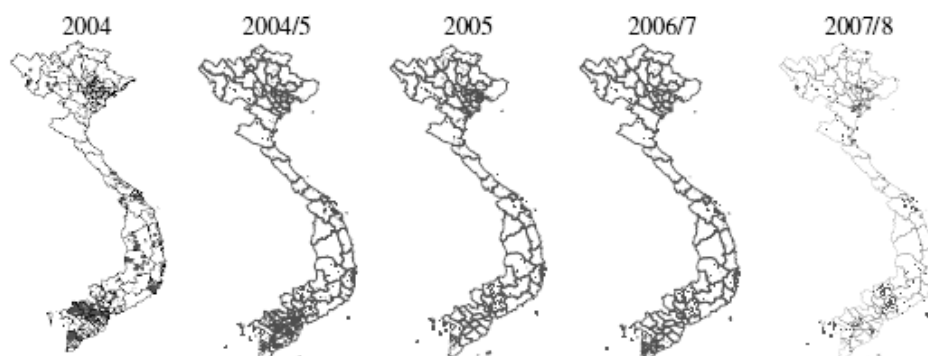
Figure II-1 HPAI Outbreak Epidemic Waves in Poultry in Vietnam January 2004 and February 2008



Source: Pfeiffer et al., 2007 and updated using World Animal Health Information Database (WAHID), OIE, 2008.

Almost all provinces have reported outbreaks in poultry with more than 50 million poultry culled. 36 per 63 provinces have human cases (Hien). Spatial patterns of the five HPAI epidemic waves presented below, see Figure II-2 (S. Burgos, J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst, 2008).

Figure II-2 Spatial Patterns of Five HPAI Epidemic Waves in Vietnam, 2004-2008



Source: Pfeiffer et al., 2007, updated with 2006-8 data from Department of Animal Health, Hanoi, Viet Nam.

In Mekong Delta region of Vietnam, HPAI outbreak were clustered in the southern part of the Mekong region, in an area with a dense network of channels and islands, where duck production represents a significant farming income (Henning. J et al, 2008).

Characteristics of HPAI disease in Vietnam of course reflect the unique nature of the poultry industry. At present, there is about more than 95% of all poultry flocks in Vietnam containing less than 50 heads and small flock accounts for over 50% of the nation’s poultry population (MARD & MOH , 2010). More specifically, sector 3 and sector 4 producers dominate the industry. This is one of disadvantages of the country in response to AI because they generally considered being more susceptible to infection due to low levels of bio-security, although losses may be larger in the event of an infection in sector 1 and concentration of birds may increase probability of virus circulation and mutation (Robert H. Beach, Christine Poulos, Subhrendu K. Pattanayak). Furthermore, small scale producers of poultry often are the poor (Otte. J, et al , 2006). We compare the industry structure of Vietnam with other countries in Figure II-3. At the end of this section, we will present how different in response to the disease relevant to industry structure by comparing Vietnam vis-à-vis Thailand.

Figure II-3 Structure of Poultry Industry by Production System in Selected Countries

Country	Sector 1	Sector 2	Sector 3	Sector 4
Cambodia	Believed not to exist	~0.4 million poultry	0.4 million chickens 0.8 million ducks	99.9% of farms and 90% of poultry (12 million chickens and 2.7 million ducks)
Indonesia	9.7 million poultry, export oriented but large proportion for national consumption	58.2 million poultry for the national market	32.4 million poultry	174 million poultry
Lao PDR	Believed not to exist	Relatively insignificant	10% of poultry	90% of poultry
Thailand	70% of national production, important export market	20% of national production	36% of farms and 7% of production	61% of farms and 3% of production
Viet Nam	Relatively insignificant	20-25% of production, but very few producers	10-15% of production, but very few producers	65% of production with possibly 70% of the country's population involved

Source: Rushton et al. (2005).

Poultry has been reared cross-nation; even the appearance of poultry in peri-urban areas around Hanoi and Ho Chi Minh cities is quite common. Some areas in Vietnam have high density of poultry-producing households, interspersed with larger commercial farms, especially in Red River Delta and Mekong River deltas. The average poultry density of Vietnam was approximately 650 birds per km² (of which, 450 chickens per km² and 180 ducks per km²) (MARD & MOH , 2010). Apparently, high density of poultry and fragmented sector as well as poor investment in poultry farm are making the ease and quick transmission of virus in the initial outbreak of HPAI when the control measures were not well prepared. In addition, producer associations were not well developed, that the poultry sector remains rather fragmented with limited capacity to provide self regulation or to partner effectively with government (MARD & MOH , 2010).

As a result, Vietnam differentiates from other countries regarding to HPAI control measure especially in compares to Thailand. Thailand and Vietnam were among the top countries having hard hit by HPAI disease and also experienced the re-concurrence of HPAI although both countries strongly commit on eradication of HPAI with interesting difference in practicing the control measures. In 2004 and 2005, Vietnam undertook the massive, repeated vaccination campaigns in combination with other control measures. On the other hand, Thailand has not applied vaccination; instead it focuses on early detection, prevention of poultry movements in high risk areas, including pre-movement testing, and transformation of the free-range duck production sector (Gilbert. M, at el , 2008). Also, according to Gilbert and his colleagues, HPAI risk in Vietnam and Thailand is essentially related to duck abundance, especially duck movement over the long distance, human population and rice cropping system, but not necessary associates with chicken numbers. The differences between Thailand and Vietnam have been resulted from the significant nature of poultry sector in two nations. Thailand has high proportion of poultry in large farms, and only 20% of national poultry population is in the land of small households, therefore, market chain is less complex than that of Vietnam, also reducing the difficulty in conducting effective farm surveillance; private sector paid more investment to protect poultry from disease in Thailand through greater investment in bio-security of farm meanwhile public sector played dominant role in eradication of HPAI in Vietnam. Thailand poultry sector is export oriented; meanwhile Vietnam is focusing on local sales only, resulting in Thailand having greater financial incentives to control disease to regain export markets by not using vaccination. In addition, Thailand has only 20 million ducks compared to 60 million ducks mostly reared under extensive condition in Vietnam; thereby, Vietnam poses a higher risk of perpetuation of viruses due to larger population of duck. Besides, live poultry is sold in majority of large market nationwide in Vietnam in the contrast with only few large live poultry markets in Thailand, this significantly reveals much higher risk of virus perpetuation in live birds market system in Vietnam compared to that of Thailand (Sims. L & Do. H.D, 2009).

III. POLICY AND INSTITUTIONAL FRAMEWORK FOR HPAI PREVENTION AND CONTROL REVIEW

III.1. HPAI Prevention and Control Policies and Measures

In general, prevention and control measures of AI include (1) provision of information and technical assistance, (2) improved bio-security practices, (3) disease surveillance, (4) culling and disposal and (5) vaccination.

III.1.1. Provision of Information and Technical Assistance

Provision of information and technical assistance measure bases on the fact that poultry grower may not have sufficient information on HPAI and appropriate disease prevention and control strategies to

make efficient decisions, especially backyard growers. Backyard growers may not be aware of the potential severity of HPAI and could have more difficulty identifying an outbreak because villagers in many developing countries may accept significant poultry losses as “normal” (Rushton et al., 2004). Development and dissemination of this information lowers the private cost of control measures for producers by reducing the time and human capital required to identify and adopt appropriate actions, thereby increasing expected adoption (Robert H. Beach, Christine Poulos, Subhrendu K. Pattanayak). None of literatures mentions provision of information and technical assistance as an independent AI prevention and control measure in Vietnam, we assume it is (partly) integrated in improved bio-security practices recommendations by government to poultry growers.

III.1.2. Improved Bio-security Practices

Strict bio-security practices that prevent exposure to any animals or other items potentially contaminated with AI are vital for preventing and controlling the spread of disease, including: closed poultry housing, ensure wild birds cannot access poultry feed and water supplies, isolate new birds or avoid their introduction into existing flocks, limit access to poultry houses and thoroughly clean all clothing, shoes, equipment and vehicles before and after coming in contact with birds, restrictions on transportation and marketing, especially at live bird markets (Robert H. Beach, Christine Poulos, Subhrendu K. Pattanayak).

Strengthening Bio-security Related Policies

There are many documents that regulate the application of bio-security measures in different situations, such as the Regulation on conditions for raising area, hatchery, transportation, slaughtering house and trading poultry and poultry products (*No. 3065/BNN-NN, 7/11/2005*), Instruction for hygienic raising of animals, egg preservation and transportation of waterfowl and waterfowl eggs issued by Department of Animal Health of Vietnam (*No. 366/TY-KD, 19/3/2007*), etc. The main contents of bio-security are (i) raise poultry flocks separately by production type and by origin; (ii) do not raise many kinds of poultry in the same cage or pen; (iii) do not mix birds with other kinds of livestock, (iv) start raising and selling the whole flock at the same time (v) strictly control the entry of animals, people, tools and products into the poultry farm; (vi) disinfect people and tools to prevent infection entering the poultry house; (iv) apply good practices: use hygienic water and qualified poultry feed with all necessary nutrients, do not use feed brought from other farms (CAP-IDRC, 2009).

Circular 69/2005/TT-BNN, dated 7/11/2005 instructs on how to disinfect the environment within a 3km radius of the epidemic point, how to spray disinfectant on transportation means that enter and leave an epidemic area (CAP-IDRC, 2009).

Strengthening Movement Control Related Policies

The transport of poultry and poultry products between provinces and cities requires a certificate from the veterinary authorities; only products from slaughtering houses or centralized processing centers that under the control of the veterinary authorities are allowed to enter urban areas (*69/2005/TT-BNN, 7/11/05*). This piece of legislation forbids the transport of live poultry and unprocessed poultry products out of epidemic areas within 21 days since the last epidemic occurred; establish control points under central government authority in the main roads between provinces and cities, working around the clock to control the interprovincial transportation of poultry and poultry products (*69/2005/TT-BNN, 7/11/05*). Establish mobile control teams to examine and handle poultry that do not pass fix quarantine positions (*69/2005/TT-BNN, 7/11/05*) (CAP-IDRC, 2009). Specific requirement for the transport of live poultry, eggs, meat are detailed in the *Resolution No. 3065/BNN-NN dated 7/11/2005* (CAP-IDRC, 2009).

III.1.3. Culling and Disposal

Culling infected birds as well as birds that may have come in contact with the sick birds has been a typical response to an HPAI outbreak and is often credited with limiting the spread of the disease. In conjunction with surveillance, early detection and culling reduces amount of virus produced by infected birds (Robert H. Beach, Christine Poulos, Subhrendu K. Pattanayak). This is obviously the first reaction of Vietnamese government to control and limit dispersion of AI. According to official reporting data, the first (2004) epidemic wave in early 2004 involved 2,506 outbreaks and lasted from Jan 10 until Feb 28. A total of 38.8 million birds were reported to have been culled during this period (S. Burgos, J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst, 2008). In the period, Vietnamese Government decided to provide a budget for the control of HPAI of 245.316 billion VND (equivalent to 15.7 million USD). The cost of culling and disposing of carcasses was estimated to be about US\$ 0.25 per bird for a 200-bird flock (CAP, 2010). The measure execution has experienced significant changes over time in terms of disposal radius and compensation level to gain cooperation from poultry breeders.

Culling and Disposal Related Policies

When the first outbreak was reported in 2004, the Vietnamese Government decided to destroy all birds including healthy poultry within a 3km radius from the affected farm (CAP-IDRC, 2009). *Circular 69/2005/TT-BNN dated 7/11/2005 of MARD* modified the above decision, making it compulsory to destroy all poultry in the affected farm only. However, if neighboring farms/household rear scavenging poultry, such poultry should also be destroyed. If two adjoining households have been infected, all poultry of these families and surrounding households should also be destroyed. If HPAI occur scattered in some households in a hamlet, all poultry had to be destroyed in the hamlet. For communes with over 50% of total households in one hamlet having poultry HPAI, destroy all poultry in that commune. To support farmers and aid the recovery of the poultry production sector, the Vietnamese Government decided to provide a budget for the control of HPAI and of 245.316 billion VND (~ 15.7 million USD) (*Decision No 396/QĐ-TTg (20/4/2004)*). Funds provided by the Central Government will cover 50% of total costs for preventing and controlling HPAI. For provinces with large numbers of birds destroyed, central Government will cover costs over the 50% limit applied above. According to this decision, the Government's compensation rate is 5,000 VND per bird (~0.3 USD/bird) and restocking rate is 2,000 VND/bird (~0.12 USD/bird) (CAP-IDRC, 2009). *Decision No 309/2005/QĐ-TTg, dated 26/11/05* increased the rate to 15,000 VND per bird (~1 USD/bird) for households that the government destroys in epidemic region and 10,000 VND/bird destroyed by households voluntarily. In 2008, under *Decision No. 719/QĐ-TTg of Prime Minister (dated 5/6/2008)*, the compensation rate increased to 23,000 VND/bird (~1.4 USD/bird) for both chicken and ducks (CAP-IDRC, 2009). Financial support to provinces for HPAI prevention and control includes depopulation costs, chemical disinfection costs, cages and environment sanitation, safety clothes, etc. at rate of 3,000 VND/destroyed head in epidemic time (*309/2005/QĐ-TTg, 26/11/05*). The maximum financial support for veterinarian and other animal health staff involved in the destruction of infected poultry and poultry products, disinfection and work at quarantine stations is 50.000 VND per working day and 100.000 VND/day on holidays (*132/2007/QĐ-TTg*) (CAP-IDRC, 2009).

III.1.4. Disease Surveillance

Disease surveillance of poultry operations to monitor birds for disease and immediately report any suspected cases of AI is another important measure for controlling the spread of disease. Proper incentives are vital for inducing producers to report suspected outbreaks. In some Asian countries, low or no compensation for birds lost is a significant impediment to disease reporting (Robert H. Beach, Christine Poulos, Subhrendu K. Pattanayak).

Large investments by government and international donors have been provided to improve quality of veterinary services to overcome the structural weakness highlighted in the first outbreaks (2004). Training programs for animal health staff at communal, district, provincial, and national level have been received considerable investment with training areas contain disease control, reporting and investigation. Training in field epidemiology for disease investigation and surveillance is being developed through the Applied Veterinary Epidemiology Training (AVET) program in order to improve veterinary capacity for broader disease surveillance and harmonization of disease investigation procedures and reports. The investments are building on a relatively low base and therefore it will take many years before Vietnam can meet all the quality standards for veterinary services defined and measured in OIE's veterinary assessment process. Agra CEAS and CIVIC consulting estimated the cost of strengthening of veterinary services and improving disease investigation capacity in Vietnam is of US\$ 30 million over a 5-year period (CAP, HPAI economic impact assessment in Vietnam, 2010). In addition to veterinary field service, major investments have been made in veterinary laboratories including training of staff, supply of new sophisticated equipment, reagents for testing and laboratory facilities. National and regional laboratories are now well equipped to diagnose avian influenza, to conduct appropriate surveillance testing for this disease and to diagnose a range of other diseases. Quality management systems are being implemented to provide confidence in the results generated. Some modifications to improve laboratory bio-safety have also been made (MARD & MOH, 2010). Vietnam has four regional reference laboratories, three are rated as bio-safety level (BSL) 2+ and one has BSL 3 designation. Two of the laboratories have been designated by WHO as National Influenza Centre and as H5N1 reference facilities (CAP, HPAI economic impact assessment in Vietnam, 2010).

III.1.5. Vaccination

Vaccination reduces the probability of infection and the amount of virus produced by an infected flock (Robert H. Beach, Christine Poulos, Subhrendu K. Pattanayak). Vaccination of poultry against HPAI may serve several objectives. It can be used as part of an eradication programme to avoid culling of a large number of flocks, to reduce the number of outbreaks and the amount of circulating virus in a country or region where HPAI is endemic, or simply as an 'insurance' used by farmers against losses from HPAI outbreaks (FAO, 2008).

A Government-led mass vaccination campaign of poultry against HPAI is introduced in Vietnam in the autumn of 2005 to increase the immunity of the national poultry flock prior to the higher risk in winter period. A second round of mass vaccination was also conducted in the spring and since then vaccination has been held twice yearly in October and April. National vaccination campaign aimed to cover 80% of poultry heads. Vaccination campaign comprised two parts. For smallholders and village flocks rearing native breeds, grandparent breeds and parent breeds, poultry for meat and poultry for eggs, vaccination is provided freely. Government budget will cover the cost of vaccine for those subjects and other cost will be covered by local budget. Only for Hanoi and Ho Chi Minh City, all the cost will be cover by local government; For large commercial farms (including domestic enterprises, enterprises with foreign investment), farm owners were required to vaccinate their poultry by covering by themselves all the cost, otherwise all of their poultry will be destroyed without compensation in case of infection. It is estimated that vaccination costs at least USD 10 million per round (MARD & MOH, 2010). During the first year of national vaccination campaign that was carried out late 2005, 364.5 million vaccinations were delivered. Investments were made in cold storage for vaccines, training of vaccinators and mass communications campaigns. The total cost for this campaign of vaccination that was implemented twice a year (in April and October) was estimated at US\$ 0.06 per bird vaccinated (McLeod A, 2007). Beside, Government had also financial support for communal veterinary staff in charge of vaccination for poultry. This one would receive averagely VND 100/bird/time with a total minimum of VND 50,000 per day. Overall budget allocation for an entire first year of vaccination is USD 22 million (Viet et al, 2005) (CAP, 2010).

Government-led Mass Vaccination Related Policies

The Government regards vaccination as one of the most important measures to control HPAI, although it should always be accompanied by other bio-security measures. *Circular No. 69/2005/TT-BNN dated 7/11/05* recommends that the province authorities aim at vaccinating over 80% of poultry. When poultry dead is found and HPAI is suspected (even as a consequence of other unknown causes), vaccination has to be applied for all poultry within 3-5 km radius around epidemic focus (CAP-IDRC, 2009).

Instruction No. 25/2005/CT-TTg dated 12/7/2005 specifies that (both parent and grandparent) breeding poultry flocks are to be vaccinated by law. Central government budget will cover the vaccination costs and local government budget will cover other costs for flocks of State owned farms and household. For poultry farms belonging to private enterprises and foreign investment enterprises, farm owners have to vaccinate their poultry and cover all the costs by themselves, otherwise, all of their poultry will be destroyed. The financial support for people involved in HPAI *QĐ-TTg dated 15/8/2007*: According to this Resolution, only people who directly vaccinate poultry will receive, on average 100 VND per bird per vaccination shot. The minimum amount that a vaccinator will receive is 50,000 VND per day (CAP-IDRC, 2009).

Decision (No. 47/QĐ-BNN-TY), signed in January 7th 2009 approved the HPAI vaccination strategy for 2009-2010. According to this, 60 billions of VND from the national budget would be spent for the implementation of the vaccination strategy (including vaccine cost, post-vaccination monitoring, and awareness and communication campaigns). Another document (*Decision 60/QĐ-BNN-TY*) approved the HPAI vaccination implementation in 2009. In this document the calendar of the vaccination campaigns was established. The first stage was implemented during April-May 2009, and the second was implemented during October/November 2009. This Decision also included the new vaccination strategy in the five GETS (Gathering Evidence for a Transitional Strategy) Provinces (CAP-IDRC, 2009).

For surveillance activities, *Instruction number 487/TY-DT was signed in April 01, 2009 by Department of Animal Health* to guide the veterinary authorities to conduct post-vaccination monitoring and assessment of HPAI virus circulation. In this document, the number of blood samples, and swab samples to be collected in each province, and the location of the farms to be sampled was presented. However the GETS provinces are exempted from this Instruction and are covered by a specific GETS post-vaccination monitoring program (CAP-IDRC, 2009).

Gathering Evidence for a Transitional Strategy Project

Given that the mass vaccination measure would burden on the Government budget and there is an increasing problem of maintaining the willingness of farmers to comply with vaccination requirements, the "Gathering Evidence for a Transitional Strategy" (GETS) project is designed to seek alternative approaches to vaccination which will be more effective and, by sharing the burden with private industry, reduce the cost to Government. The project "Gathering Evidence for a Transitional Strategy" (GETS) looks at alternative vaccination strategies in both high and low risk provinces for HPAI H5N1 (High risk are Nam Dinh, Ninh Binh, Soc Trang and Hau Giang provinces; low risk is Quang Binh province). In the four high risk provinces in the Red River Delta and the Mekong Delta, the alternative vaccination strategy being proposed is an age based vaccination strategy targeted at ducks. The rationale for this is that improved immunity in ducks, which can act as silent carriers and virus shedders, will provide protection for other poultry that they contact. With the Government's agreement, the mass vaccination of backyard chicken flocks was removed from the Government supported program in four of the project provinces. The project is a transition towards the Government being less directly involved in vaccine delivery to small commercial and backyard chickens; transferring the financial burden of vaccination increasingly towards the farmer. The vaccine

chosen for these trials is the Chinese Harbin inactivated oil adjuvant H5N1 vaccine as this is currently both the most immunogenic vaccine in chickens and ducks and the cheapest. In a selected low risk province which has decided not to have compulsory vaccination for chickens or ducks, an observation study will be carried out looking at the role of increased surveillance. The vaccination strategies to be piloted in the 5 provinces as developed by FAO Vietnam.

GETS PROGRAM	Nam Dinh V2	Ninh Binh V2	Quang Binh V0	Hau Giang V2	Soc Trang V2
Remove Gov Vaccination in these production units	All Chickens (except one parent flock)	All Chickens (except commercial layer chickens)	All poultry in 4 districts (Bo Trach, Quang Trach, Minh Hoa, Tuyen Hoa)	All Commercial Chickens	All Chickens
Additional Targeted Vaccination	Monthly vaccination -newcomers into duck flocks	Monthly vaccination - newcomers into duck flocks	No	Monthly vaccination - newcomers into duck flocks	Monthly vaccination -newcomers into duck flocks
Maintain Gov Vaccination as per Gov Directives	All ducks & One parent chicken flock	All ducks & Commercial layer chickens	All poultry in 3 districts (Le Thuy, Quang Ninh, Dong Hoi)	All ducks & Free ranging chickens	All ducks
Vaccine Available for Private Purchase	Yes	Yes	Yes	Yes	Yes

Source: SCAP, 2010

Thanks to the GETS project, the vaccination strategy had achieved higher efficiency by a reduction of total cost and better control of risks of HPAI outbreaks. The strategy of focusing vaccination mainly on high-risk source for AI (i.e. ducks and especially mobile duck flocks) has shown positive effects. The surveillance activity in project provinces had been improved by applying the suspicion investigation and duck sentinel for early warning for AI outbreak, together with AI circulation testing (Swab sample testing) and Post-vaccination monitoring. However, the requirement of increased surveillance activity and intensive suspicion investigation increased some cost components of the control program. An increase in the cost per positive case was due to the small number of positive samples coupled with the increased cost of surveillance activities. Remarkably, the number of AI outbreaks in the GETS provinces reduced significantly, which decreased the control cost of AI outbreaks per province in the GETS period (targeted vaccination) to one fourth of that in the corresponding pre-GETS (mass vaccination) period (SCAP, 2010).

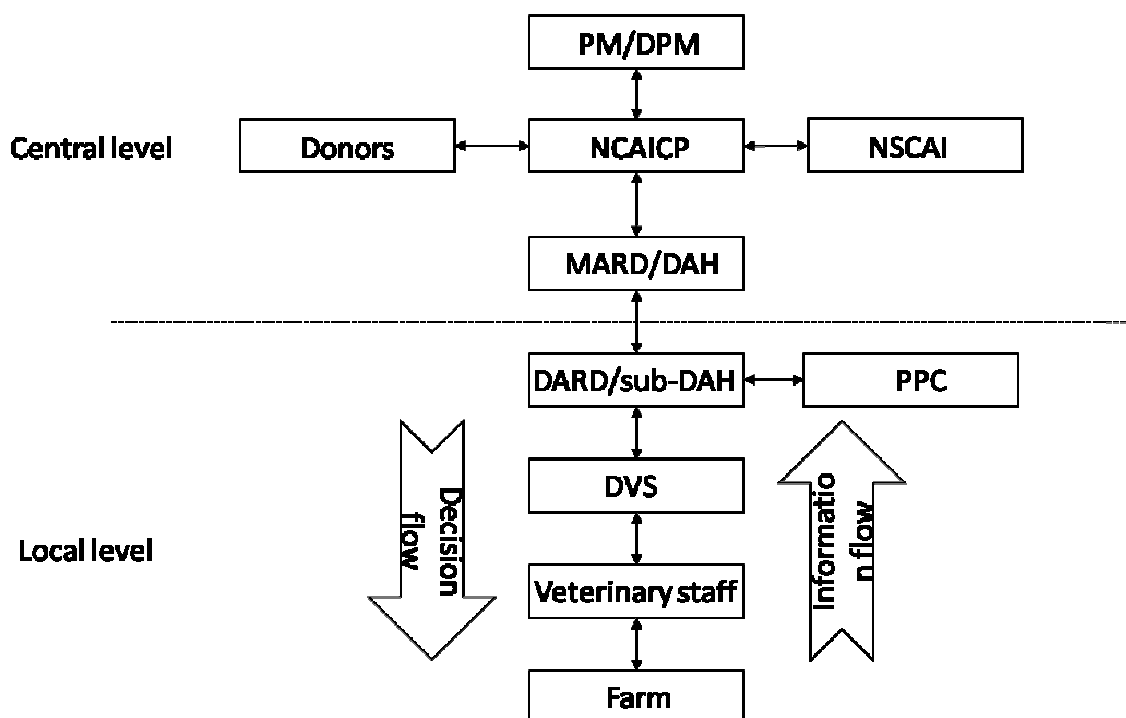
III.2. Institutions Involved in HPAI Control Policy Making and Implementing

Since the first outbreak of AI in mid-2003, Vietnam has implemented a range of measures to control and prevent the disease dispersion with varying degree of success, these included large-scale culling, movement controls and closure of live poultry markets, banning poultry keeping in some major cities, campaigns to educate the public about preventive measures, as well as, from 2005 onwards, large-

scale vaccination campaigns (S. Burgos, J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst, 2008). The efforts are result of a top-down decision making process and implementation from central level to local level, supported by a bottom-up information flow for decision making. Department of Animal Health (DAH) with support/ supervision of NCAICAP, NSCAI, donors plays a key role for decision making and coordinating disease control efforts at central level meanwhile its sub-DAHs with support of Provincial People Committees (PPC) play the same role at local level.

The public animal health system is supplemented by a network of private para-veterinarians, but there is little public-private coordination (S. Burgos, J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst, 2008).

Figure III-1 Institutions Involved in HPAI Control Policy Making and Implementing



Central Level

At central level, Viet Nam established a National Committee for Avian Influenza Disease Control and Prevention (NCAICP) in January 2004, as the national coordination mechanism. It is chaired by the Minister of Agriculture and Rural Development. Ministries of Health, Public Security, Transportation, Trade, Foreign Affairs, Culture and Information, Science and Technology, and Natural Resources and Environment are members. This Committee meets on a weekly basis to brief the Government on the evolution of the disease situation and report on the implementation of the control measures. The Prime Minister and Deputy Prime Minister have chaired several of these meetings. The National Committee has also been entrusted with the responsibility for Government – Donor coordination (S. Burgos, J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst, 2008).

In addition to NCAICP, a more specifically committee for the human health aspects which evolved from the National SARS Steering Committee established in 2003, is the National Steering Committee for Human and Avian Influenza among Humans (NSCAI), also plays an important role in HPAI control and prevention decision making process (MARD, 2006). In September 2005 the NSCAI prepared a National Preparedness Plan in response to Avian Flu Epidemic H5N1 and Human influenza Pandemic, which was approved by the Prime Minister in November 2005. This integrated plan designed

responsive measures under WHO's pandemic phases and scenarios, and allocated responsibilities and actions for ministries, People's Committees at all levels and other organizations. In February 2006, the government established a National Task Force under the NSCAI, whose main task has been to develop the Integrated National Operational Program for Avian and Human Influenza – The Green book (S. Burgos, J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst, 2008).

The general purposes of the Green book are:

- To identify activities envisaged by MARD, MOH and other agencies to develop a framework for enhancing the existing integrated approach to HPAI control and pandemic preparedness over a five-year period (2006-2010);
- To provide a framework for resource mobilization within an integrated strategy developed by the government and endorsed by international partners; and
- To provide a framework for coordination and collaboration between the Government of Vietnam and international partners in the fight against HPAI

Content of Green book includes 3 parts: (I) Enhanced Coordination Activities, (II) HPAI control and Eradication in the Agricultural sector and (III) Influenza prevention and pandemic preparedness in the health sector; of which part 1 focuses on establishing policy and strategy for HPAI control, coordination framework at central level.

Under NCAICP and NSCAI, Department of Animal Health (DAH) under Ministry of Agriculture and Rural Development (MARD) is responsible for national HPAI disease control as well as other animal diseases. The DAH is certainly having a central role in making plans and implementing HPAI disease control and prevention measures at national level. Each province has a sub-DAH with many District Veterinary Services (DVS) under its supervision. There are more than 600 DVS covering the whole country with respect to animal health professionals is quite good, according to D'Andlauer et al. (2004). Delquigny et al. (2004), however, report a lack of coordination between central and provincial levels resulting in difficulties in applying national decrees, while animal health inspectors frequently report a general lack of staff to keep up with inspection needs (S. Burgos, J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst, 2008).

Local Level

The process of identification and control HPAI disease at local level was stipulated in Veterinary Law in 2004. When breeder detects infected/died poultry or any suspected signs of bird flu within his flock, the flock must be isolated and the breeder has to report to local veterinary staff. After receiving the disease notification, veterinary agency must diagnose and identify the type of disease rapidly. Sub-DAH under Department of Agriculture and Rural Development (DARD) is responsible for testing the HPAI infection sign. If the sign confirmed, sub-DAH recommends Provincial People Committee (PPC) to announce HPAI disease appearance in the province. Head of PPC decides to announce HPAI disease appearance upon the following conditions: (i) District People Committee reports on AI situation; (ii) a diagnostic result of AI infected poultry and (iii) DARD/sub-DAH recommendations. Head of PPC is in charge for directing agricultural agencies, related organizations and individuals to implement control and prevention measures.

IV. VIETNAM POULTRY VALUE CHAIN

Many actors participate in poultry value chain to generate and satisfy consumer values on poultry products. They include feed manufacturers, poultry breeding farms, poultry farms, traders, slaughterhouses and finally consumers.

Feed manufacturers and poultry breeding farms provide commercial feed and poultry breeds that are essential inputs to poultry farms. Foreign owned feed manufacturers and poultry breeding farms dominate the markets. The industries also rely on import sources to meet material demand.

Poultry farms are dominated by small scale farms, characterized by low to minimal bio-security, generally under 150 birds, commercial oriented but limited sale still accounting for a significant portion. In fact, a few back yard chickens are raised by most rural families in Vietnam. The farms are first priority targets of HPAI A(H5N1) viruses. Semi-commercial and industrial farms with moderate to high bio-security are increasing their share in the industry.

Traders are intermediaries who distribute input materials from feed manufacturers and poultry breeding farms to poultry farms; poultry products from poultry farms to final consumers. They vary in scale and operation. In terms of distribution issue, large retail firms play a minor role in compares with small individual retailers at traditional markets who sell live birds combining with slaughter for consumer at the same place, even hygiene and food safety condition is very poor. Although traders have an important role in forming distribution channels, they are also key actors who responsible for spreading HPAI A(H5N1).

Slaughterhouses are small scale, not very industrialized; their meat was not of acceptable quality for export even basic food safety and environmental standards.

Vietnamese consumers have a habit of purchasing live birds with slaughter taking place at the market or consumers homes. Poultry products were not certified by animal health authorities, were not packaged and were produced under questionable conditions of food safety and hygiene. HPAI outbreaks have changed the behavior of consumers toward more food safety products, which in turn may trigger the common practice of producing the safe products in the poultry value chain.

There are four types of poultry value chain in Vietnam corresponding to four different production systems in which small farmer and semi-commercial farmer poultry value chain (sector 4 and 3) dominate.

IV.1. Value Chain Actors

IV.1.1. Feed Manufacturers

Vietnam poultry industry normally consumes an estimated 0.8 - 1 million tons per year of complete feed (2008), account for over 10% of total feed consumption of Vietnam livestock sector, nearly all of which is directed toward semi-commercial and industrial poultry farms. Small farmers raising local chicken represents for backyard poultry production system, use available household by-product food to feed their poultry rather than using concentrate feed.

The country animal feed industry uses maize, cassava, soybean meals and rice bran as input for feed manufacturing process. The industry has to import 3.7 - 4.0 million tons of raw materials every year (2009).

Total number of registered feed manufacturers in Vietnam was 225 in 2008, consists of 42 foreign, 12 joint ventures and 171 domestic animal feed manufacturers.

Foreign animal feed manufacturers dominate market, they account for 60 - 70 percent of market share. Large manufacturers are most of foreign ones like: CP Group, PROCONCO, Cargill, JAPFA, Fuyomarc'h, Nutriway, Centralys, etc .

Feed manufacturers both foreign and domestic provide services and additional supports to their distribution channels (wholesalers, retailers) and end-customers (small scale households, semi-commercial and industrial farms). Nutrition and veterinary consultancy is a major service provided by more than 60 percent of feed manufacturers to their agents/end-customers. Beside, transportation service is also provided although mostly by domestic feed manufacturers. They accept credit/delayed payment methods, commission/discount for their agents.

The AI outbreaks have had a sharp effect on feed manufacturers, particularly those selling to semi-commercial producers. For instance, An Phu Animal Feed Enterprises, a member of Saigon Agricultural Corporation, reported a drop of 90 percent in feed production while CP Animal Feed Group reported a drop of 60-70 percent because farmers almost universally reported keeping far less poultry than before the crisis, and feeding their birds the minimum rations necessary to sustain them (ACI, Impact of AI on poultry sector restructuring and its socioeconomic effects, 2006).

IV.1.2. Poultry Breeding Farms

There are three kinds of breed used in chicken production: local, crossbred and industrial breeds in which local ones are maintained by own breeding stock or buying from local producers, crossbred and industrial breeds are almost sourced from poultry breeding farms/hatcheries. A few back yard or "local" chicken are raised by most rural families in Vietnam. This is a traditional extensive backyard poultry production system which accounts for 56 percent of chicken meat, 82 percent of chicken eggs and 61 percent of total chicken population in Vietnam (2006) (PPLPI). Small farmer households especially poor households tend to specialize in local breeds and they are more likely to maintain their own breeding stock or buy chicks from local producers rather than poultry breeding farms/hatcheries.

Commercial breeding farms are dominated by a few foreign-owned poultry holdings such as CP Group, Japfa Comfeed, Topmill, etc and almost all poultry breeding stock is now produced by private enterprises. Overall, state farms supply about 15 percent of breeding chicks (down from 38 percent in 1995), while large private companies supply about 80 percent, and smaller Vietnamese companies - mainly in the south - supply the remainder (ACI, Impact of AI on poultry sector restructuring and its socioeconomic effects, 2006). Viet Nam has 11 state poultry breeding farms with 3,000 GGP and 18,000 GP stock, while the number of private poultry breeding farms stood at 106 (10 foreign-owned company farms, 20 provincial company farms, the remaining is private farms). The chicken breeding farms/hatcheries system produces 100-120 million commercial chicks every year.

Chicken production absolutely depends on import sources for high productivity stock. Recently, Vietnam has imported 1 million GP and 4,000-5,000 GGP every year to produce breeding chicks.

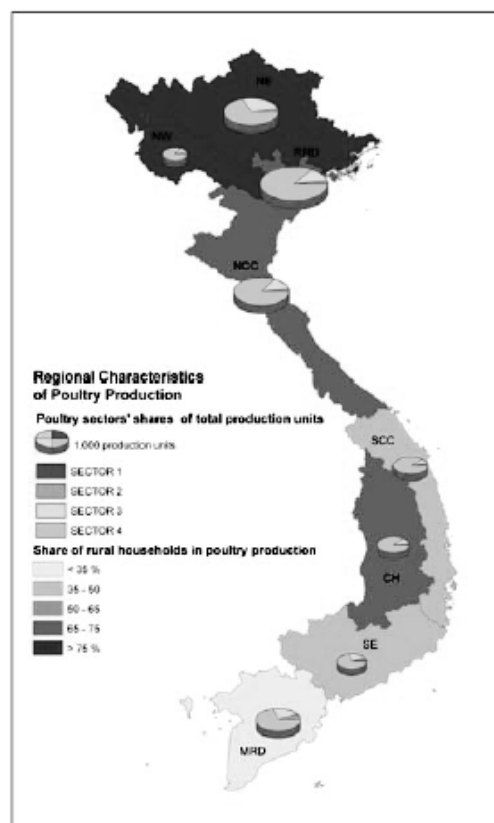
The production of breeding chicks has fallen sharply with the AI outbreaks, particularly among domestic producers (ACI, Impact of AI on poultry sector restructuring and its socioeconomic effects, 2006).

IV.1.3. Poultry Farms

Poultry production system in Vietnam classified into 3 systems based heavily on the fourfold production system classification adopted by the FAO for the poultry sector based on farm scale and level of bio-security (Official classification criteria have not been established by the Vietnamese Ministry of Agriculture and Rural Development): (i) traditional extensive backyard poultry production (sector 4); (ii) semi-intensive, small to medium scale, market-oriented, commercial poultry production (sector 3 and 2); (iii) intensive, large scale, industrial poultry production (sector 1) (PPLPI, The poultry sector in Vietnam: prospects for smallholder producers in the aftermath of the HPAI crisis).

Figure IV-1 FAO Fourfold Production System Classification

- Sector 4:** 'Village or backyard production with minimal bio-security and birds/products consumed locally.'
- Sector 3:** 'Semi-commercial poultry production with low to minimal bio-security and birds/products usually entering live bird markets (e.g. a caged layer farm with birds in open sheds; a farm with poultry spending time outside the shed; a farm producing chickens and waterfowl).'
- Sector 2:** 'Commercial poultry production system with moderate to high bio-security and birds/products usually marketed commercially (e.g. farms with birds kept indoors continuously; preventing contact with other poultry or wildlife).'
- Sector 1:** 'Industrial integrated system with high level bio-security and birds/products marketed commercially (e.g. farms that are part of an integrated broiler production enterprise with clearly defined and implemented standard operating procedures for bio-security).'



Source: FAO, 2004.

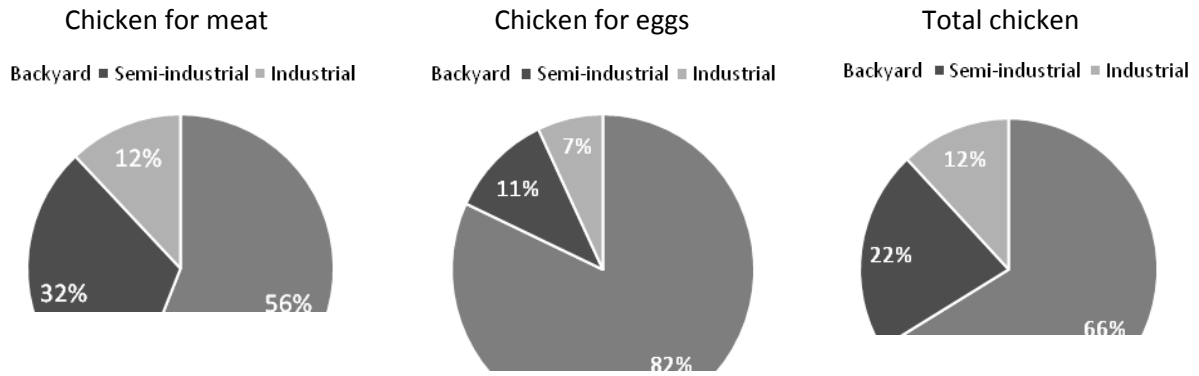
General Statistics Office of Vietnam based on the FAO classification (as we assume) to define more specifically poultry production system in Vietnam, as of following:

	Sector 1	Sector 2	Sector 3	Sector 4
	Industrial integrated	Commercial	Semi-commercial	Village or backyard
Birds size	>2000 heads	151-2000 heads	51-150 heads	1-50 heads
Bio-security	High	Moderate to high	Low to minimal	Minimal
Bird and product marketing	Commercial	Usually commercial	Birds usually sold in live market	Birds and products consumed locally

Source: GSO, 2004.

Farms tend to be small although number of farms raising chicken on an industrial scale is increasing. Traditional smallholder production (sector 4 and 3) still dominates national poultry output 60%, however poultry raised under the semi-industrial commercial (sector 2) and industrial system (sector 1) have been rapidly increasing their share of national output (2006) (PPLPI, The poultry sector in Vietnam: prospects for smallholder producers in the aftermath of the HPAI crisis).

Figure IV-2 Proportion of Chicken for Meat, for Eggs and Total Chicken by Production System



Larger, wealthier farmers are more specialized in raising chicken, and largely raise crossbred and industrial breeds. Smaller, poorer farmers are less specialized, and mainly raise local breeds (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008).

The majority of the commercial chick producers interviewed raise crossbred or industrial chicks due to higher turnover although margins are lower in comparing to local chicken. Returns to local chicken are the highest, calculated by Otte (2006) to be up to 600%. This is largely due to the fact that local chicken require few inputs and can utilize byproducts. Vietnamese consumers also prefer local taste than industrial taste therefore they pay higher prices for local chicken (Poultry supply chains and market failures in northern Vietnam, PPLPI 2008). Returns on industrial breeds are much lower, given that feed inputs are required and prices are much lower. However, turnover of industrial breeds is higher because they grow much quicker and hence farmers experience more production cycle per year. More income per farm could be generated by raising industrial chicken for this reason, although margins are lower (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008).

Farms report sales peaks in early fall (Aug-Nov) and winter (Nov-Jan), which indicates that sales are indeed following harvests, as the two rice harvests tend to fall in June and September/October (Poultry supply chains and market failures in northern Vietnam, PPLPI 2008). Smaller farms increase sales according to seasonal demand and feed availability. Large farms appear not to be affected by seasonal demand or seasonal feed constraints. Most likely they are operating under contract for regular sales (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008).

Small Scale Farmers

Small farmers produce local chicken and sells to nearby market or urban areas though informal channel (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008).

Local (free range) chicken breeds cannot be caged, do not efficiently convert concentrate feed, grow slowly but generally require few inputs. They are also known for being “hardy”, or being able to handle a free range environment with greater stress. Poor farmer households tend to specialize in local chicken (because of it does not require large investment on infrastructure and credit for concentrate feed) (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008).

Backyard or “local” chicken production constrained by overall farm size, open space and availability of farm/household food by products (Poultry supply chains and market failures in northern Vietnam,

PPLPI 2008). The timing of rice harvest and availability/affordability of concentrate feed may play a large role in constraining backyard poultry production (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008).

Medium and Large Farms & Large Companies

Medium and large farms sell through formal, regulated channels such as wholesale markets (Poultry supply chains and market failures in northern Vietnam, PPLPI 2008). Large companies have built their own slaughterhouses; nearing complete vertical integration (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008).

These farms/companies tend to specialize in crossbred and especially industrial chicken (because of they can afford high investment cost). Chicken used for industrial production are fast growing under a diet of concentrate feed, and can be grown in small spaces. They require more healthy inputs and a protected environment; they do not adapt as well to environmental stress (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008). The cost of commercial feed accounts for up to 70% of the cost of raising industrial chicken (ACI, Impact of AI on poultry sector restructuring and its socioeconomic effects, 2006). Industrial chicken production constrained by production infrastructure (cages, protective buildings) and credit for purchase of concentrate feed (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008).

IV.1.4. Traders

A wide array of traders operating at various scales distribute inputs and poultry in Vietnam, including distributors of feed and breeding chicks, assemblers collecting live poultry at farm-gate, and wholesalers and retailers selling live and processed birds (ACI, Impact of AI on poultry sector restructuring and its socioeconomic effects, 2006). Most distributors of feed represent large companies, while most other traders operate independently.

These traders generally transport their products over short distances by motorbike (ACI, Impact of AI on poultry sector restructuring and its socioeconomic effects, 2006). Most chicken traded in northern Vietnam are transported by motor bike or bike all or part of the way to the retail market, although trucks are also used by traders serving the largest wholesale markets (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008).

The AI epidemic has affected traders (in both urban and rural areas) particularly given the prohibitions on selling live poultry in cities, the general collapse of poultry production/demand and the consequent decline in market sales. Moreover, traders who extended credit to farmers before the epidemic were typically unable to recover these loans (ACI, Impact of AI on poultry sector restructuring and its socioeconomic effects, 2006).

Retailers

There are many retailers in markets in whole country to sell poultry products. Most of them sell live products because of small market for processed and frozen products. They buy products from traders/wholesalers and farmers and sell directly for consumers. The retailers usually sell live birds combining with slaughter for consumer in the same place in the market. Processed and frozen products were sold in super-markets and company's distribution place with small volume in big cities.

In the retail place, food-safety conditions is very poor; and this is one of reasons that AI spreads rapidly and difficult to control. The AI outbreaks have had sharply effect on retailer, particular retailer

for live birds, due to a drop of demand. Meanwhile, consumers move to buy safer products (packaged products, certificated products ...) in super-markets.

IV.1.5. Slaughterhouses

As of 2006, there were 136 slaughterhouses, most of which are small scale, not very industrialized; their meat was not of acceptable quality for export even basic food safety and environmental standards.

Until recently, most farmers regardless of scale produced live chicken sold on local markets, with most slaughter taking place at the market, small scale unregulated slaughterhouses (operating at low levels of technology and hygiene) or consumers' homes. The situation has changed with government directives prohibiting all but licensed slaughter of poultry in urban areas. Hanoi and HCMC currently require poultry meat to be slaughtered in specified abattoirs as part of a closed production system, and then packaged and frozen before being sold either at supermarkets or company "selling points". As of December 2005, HCMC, which responded earlier than Ha Noi to the epidemic, had three licensed slaughterhouses that were permitted to continue selling their products within the cities, this down from more than 50 slaughterhouses identified earlier. By 2007, government plan calls for the construction of 14 slaughterhouses to meet the city's poultry demand. Hanoi authorities have proposed the construction of ten temporary emergency slaughterhouses in suburban districts, but these have not yet been built. In the longer term, they envisage construction of four factories and three slaughterhouses that would meet 70 percent of local demand (ACI, Impact of AI on poultry sector restructuring and its socioeconomic effects, 2006).

IV.1.6. Consumers

Vietnamese consumers have a habit of purchasing live birds with slaughter taking place at the market or consumers homes. This is especially true with local breeds which preferred by local taste. Industrial breeds are purchased in the form of carcass. Before HPAI outbreaks occurred, over 95 percent of total poultry output was sold as live birds. Live birds were sold at farm gates, in wet markets, in rural markets, along the road as well as in temporary or makeshift markets in cities.

Poultry products were not certified by animal health authorities were not packaged and were produced under questionable conditions of food safety and hygiene (PPLPI, The poultry sector in Vietnam: prospects for smallholder producers in the aftermath of the HPAI crisis). A small proportion of poultry products were certificated packaged and sold in super markets and company store.

Most of consumers consume local poultry meat without safety brand (nearly 70% on average). In contrast, for industrial and crossbred poultry meat, over 70% households buy products certificated safety. However, consumers do not strongly believe in products certificated by the government (CAP-IPSARD, 2009).

HPAI outbreaks changed the behavior of consumers toward more food safety products, which in turn may trigger the common practice of producing the safe products in the poultry value chain. CAP study (2008), which surveyed consumers' attitude in response to poultry consumption pattern during and post AI at short term shown that 75% of households interviewed stopped eating poultry meat. Only 21.3% of interviewed households continued to eat poultry meat but with less quantity and 24.68% of households totally changed to pork and beef when HPAI occurred. Demand for poultry products dropped 50-60%. In the field of poultry meat import, after HPAI outbreaks in 2004, Vietnam government had policy to ban poultry meat imports from infected countries, leading to a decline in volume from 1078 tons in 2003 to 496 tons in 2004 (CAP-IDRC, 2009).

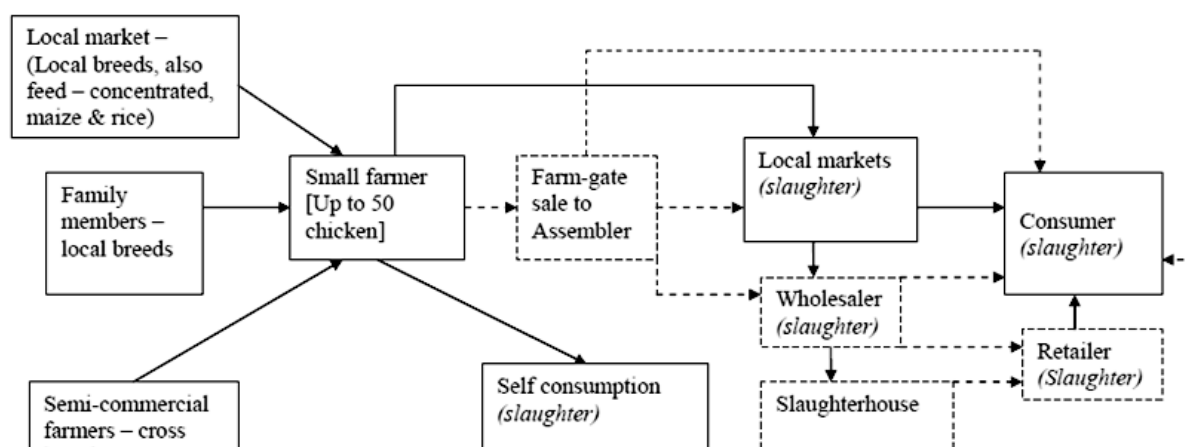
Food safety currently still ranks as the first key concern of consumers regarding to poultry meat purchased in market according to the survey carried out in Hanoi in 2008 and Ho Chi Minh City in 2010 (Ifft, 2010).

IV.2. Value Chain Mapping

By connecting identified actors in the previous section together bases on flow of product, we map the poultry value chains. As mentioned, poultry production system in Vietnam classified into 3 systems: (i) traditional extensive backyard poultry production (sector 4); (ii) semi-intensive, small to medium scale, market-oriented, commercial poultry production (sector 3 and 2); (iii) intensive, large scale, industrial poultry production (sector 1). Each production system has its own value chain features which determined mostly by farm scale. This in turn influences to the distribution of power or coordination structure of the value chains. Therefore we present here 4 poultry value chains corresponding with 4 different kinds of producers, quoted from "Impact of AI on poultry sector restructuring and its socioeconomic effects, p. 18, ACI 2006". Impacts of AI disease to the product flow in the value chains also described by the authors with different dash types.

Sector 4

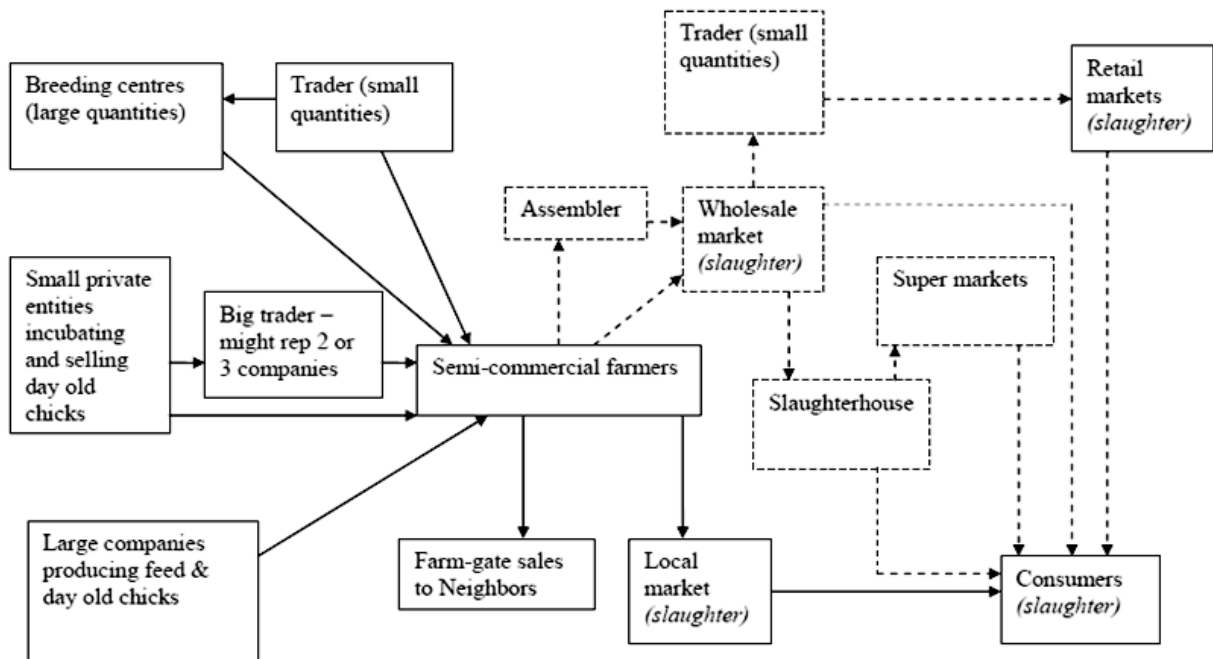
Figure IV-3 Small Farmer Poultry Value Chain



Note: Dashed lines indicate activities/linkages in evidence before AI, while the straight lines indicate the value chain as of December 2005.

Sector 3

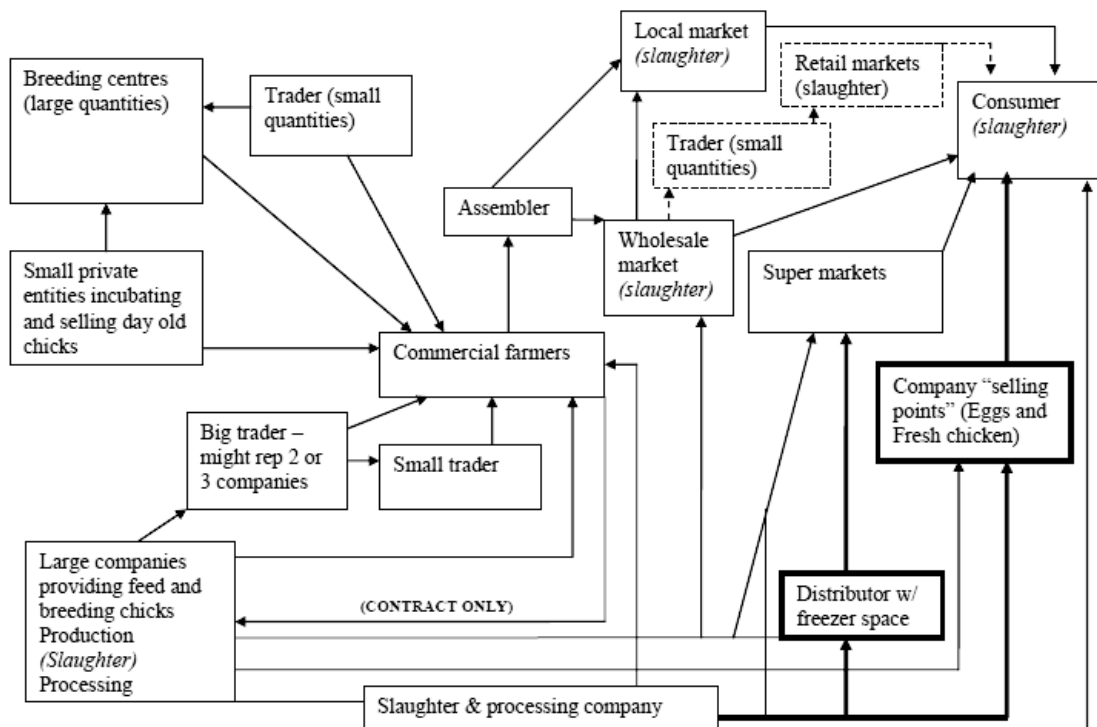
Figure IV-4 Semi-commercial Farmer Poultry Value Chain



Note: Dashed lines indicate activities/linkages in evidence before AI, while the straight lines indicate the value chain as of December 2005.

Sector 2

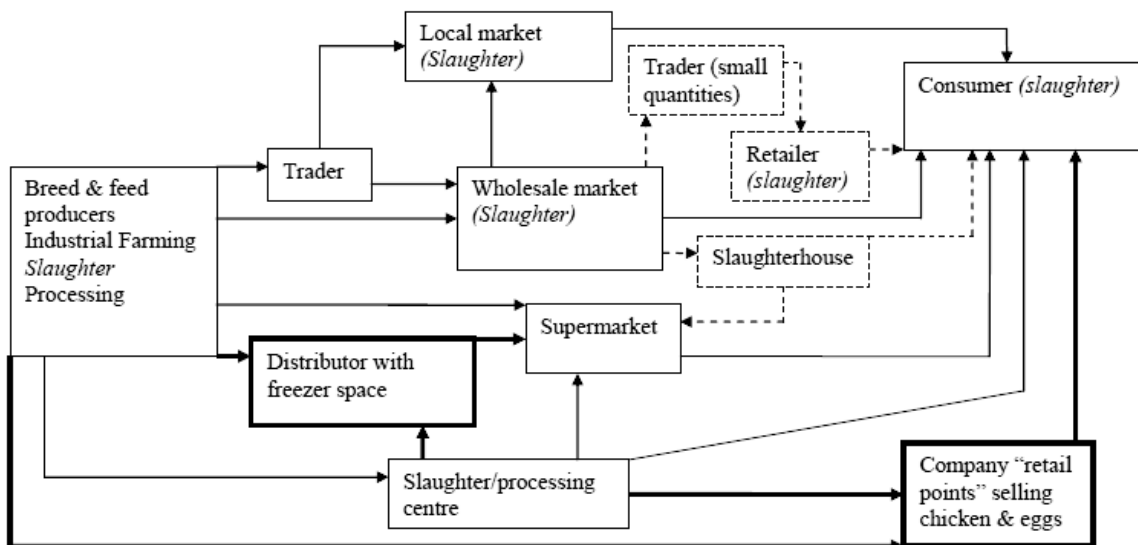
Figure IV-5 Commercial Farmer Poultry Value Chain



Note: The straight lines indicate the value chain before AI and in December 2005, dashed lines indicate activities/linkages no longer in evidence as of December, while the bold lines indicate new activities/linkages as of December.

Sector 1

Figure IV-6 Industrial Farm Poultry Value Chain

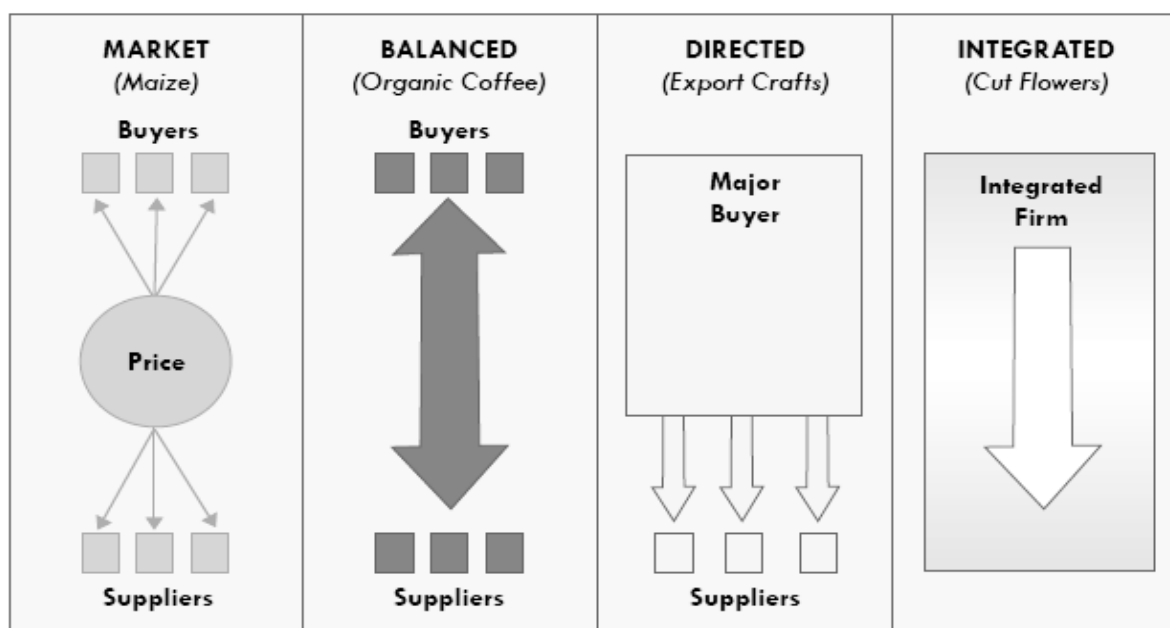


Note: The straight lines indicate the value chain before AI and in December 2005, dashed lines indicate activities/linkages no longer in evidence as of December, while the bold lines indicate new activities/linkages as of December.

V. GOVERNANCE ANALYSIS

Every value chain has a system of coordination which includes formal and informal arrangements between participants. Coordination structure can be described along a continuum extending from the market, characterized by "arm's-length" relationships, to hierarchical value chains illustrated through direct ownership of production processes. Between these two extremes are two network-style modes of governance: balanced and directed.

Figure V-1 Value Chain Governance Classification Applied to Pro-poor Markets



Source: (SNV 2008)

There appear to be existence of three types of governance structure inside the poultry industry. Those are: market, directed and hierarchical of which market governance plays a pivotal role.

The directed and hierarchical based value chains respond well to AI disease and require minimal or no support from government. Meanwhile, the market based value chain requires much more efforts to prevent and control the disease.

In the market based governance value chain, distribution of power between participants (feed mills, poultry breeding farms, poultry farms, traders, slaughterhouses, consumers) is quite evenly (in compares to other governance structures). This means there are no lead firms or actors having dominant roles. In addition, the coordination structure characterized by spot transaction, little information is exchanged between actors; interactions between actors are limited; and technical assistance is not provided. This implies that to respond well to AI disease it requires additional coordinated efforts beside free market price such as technical assistance, etc. Market governance implies that in order to improve efficiency of the chain, it is necessary to influence all participants in the way that changes their behaviors following our purpose. Of the all links of the chain, poultry farms/breeding farms are key links that need to be focused. If we could prevent and control well the problem in the breeding activity, we minimize cost and effort for the rest activities.

Another implication from governance analysis in order to perfectly respond to AI disease is that restructuring the poultry industry which encourages semi-industry and industrial commercial farms (sector 1 and 2). In fact, poultry raised under the semi-industrial commercial (sector 2) and industrial system (sector 1) have been rapidly increasing their share of national output (2006). This is a long terms trend. There has been a changing nature of agricultural markets from a system of market-based transactions to an integrated, agro-food channel where networks of relationships between suppliers, processors and retailers are the key drivers of product distribution and innovation. The development of such value-chains is increasingly shaping agriculture and agribusiness, and can confer distinct advantages in improving the efficiency of the supply channel and the quality of the finished product. However, the ability of the poor to benefit from such relationships merits attention, particularly in the case of poultry where the emergence of a new set of standards arising from the AI epidemic is prompting sector wide restructuring in the areas studied (ACI, Impact of AI on poultry sector restructuring and its socioeconomic effects, 2006).

V.1. Market Governance

Market governance appears in all of the four value chains of Vietnam poultry industry. It is an only coordination mechanism in the small farmer poultry value chain (sector 4) and the semi-commercial farmer poultry value chain (sector 3). It exists simultaneously with directed and hierarchical coordination structures in the commercial farmer poultry value chain (sector 2) and the industrial farm poultry value chain (sector 1).

Market governance characterized by arm's-length transactions on spot market among actors of a poultry value chain. There are many commercial feed agencies, poultry breeding farms, poultry farms, assemblers, wholesalers, slaughterhouses, retailers, etc who are **independent** and on an equal footing, participate in the transactions. They could repeat the transactions with each others in future but not necessary. They share little information and provide no (or little) technical assistance (in compares to other governance structures). In general, their interactions are limited and there are limited incentives to create ongoing relationships. In such value chains, quality and price are determined by the market, not by lead actors (usually lead firms). The distribution of power is quite evenly among the actors. This should be understood as each actor has a certain power to set conditions, standards which influence the remaining ones but no actor has a dominant role.

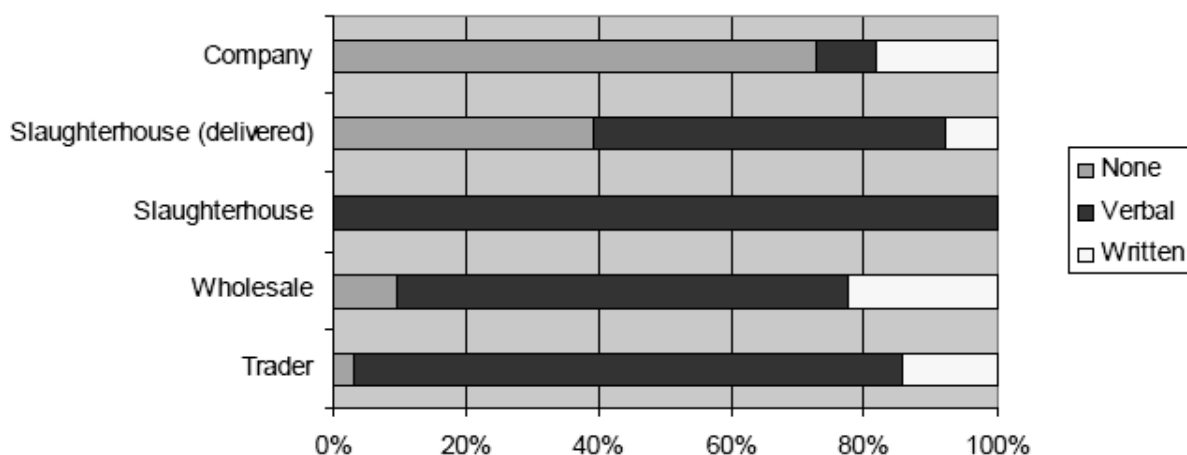
Small farmers raise local chicken, under 50 chickens, and mostly for the purpose of family consuming, rather than selling out. Local breeds purchased from either local market or family members. In case of raising crossbreds, they buy breeds from semi-commercial farmers. Household foods by products are major source of feed but they also use concentrate feed. Live poultry or eggs sold at farm-gate to assemblers or they themselves bring to local market for marketing. Since then, the products went through different actors of distribution channels including wholesalers, slaughterhouses, and retailers to consumers. This is actually the way value generated in the small farmer poultry value chain (sector 4). For more detail see Figure IV-3.

Larger scale farmers in compares to small farmers in sector 4, or semi-commercial farmers (sector 3), raise mostly crossbreds with bird size ranges from 50-100 heads, for commercial purpose rather than self consumption. The farmers deal with more diversified and professional input suppliers. Feed and DOCs come from breeding centers (for large quantities), traders (for small quantities), small private entities & their representative traders, and also large companies. Outflow of their products is similar to small farmers' however distribution channels are more complex with the appearance of wholesale markets, retail markets, and super markets. For more detail see Figure IV-4.

The two value chains characterized by independent actors attending arms' length transactions on spot market. A farmer sells live birds at farm gate to an assembler who he has no formal contract with. They bargain on price and make deal. The farmer paid in cash and the assembler received his live birds. They could repeat transactions with each other next times but not necessary. The farmer may refuse the assembler due to lower price received from him and deal with the others for a better price. Similar transactions happen among other actors of the chains.

Informal contracts were unwritten but nevertheless binding agreements between a farmer and his market intermediary, which could either be a trader for inputs or outputs, or with a cooperative which he is a member of, on the provision of inputs or the marketing of output, or both (PPLPI, Contract farming as an institution for integrating rural smallholders in markets for livestock products in developing countries: results in case countries, 2009). Informal contracts dominate agreements to purchase poultry in the market governance. Poultry producers and intermediaries have locked-in informal relationships with their trading partners. This is also indicates that producers rarely initiate production without a certain buyer. See Figure V-2 (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008). Producers and traders are playing a "repeated game", where if one player defects, she/he can be excluded from future interactions or otherwise "punished". Poultry trade in northern Vietnam, especially trade of local breeds amongst small players, is thus governed by a series of high trust informal relationships that are essential for market participation (PPLPI, Poultry supply chains and market failures in northern Vietnam, 2008).

Figure V-2 Contractual Relationships with Poultry Suppliers



If the actors have informal contracts or relationships with each other's how could we claim that they are independent? Independence of actors has a relative meaning. Informal contracts are obviously higher independent degree in compares to formal contracts which were usually written contracts between an integrator company and a farmer, where the rights and obligations of each party were strictly defined (PPLPI, Contract farming as an institution for integrating rural smallholders in markets for livestock products in developing countries: results in case countries, 2009). Formal contracts are dominate agreement to purchase poultry in directed governance.

In addition to arms' length transactions, the actors in the market governance chain share little information and provide no (or little) technical assistance.

Each actor has a certain power and no actor has a dominant role. Traders may want to impose some certain quality standards on poultry products however if farmers do not follow, they have no choice except purchasing the farmers' products. This is a rule of "purchasing or leaving". It is especially true in

small farmer poultry value chain (sector 4) in which farmers raise poultry for household self-consuming. It seems like the more production is commercial oriented, the more it is actors coordinate together to satisfy consumer demand.

We will explain market governance of the commercial farmer poultry value chain (sector 2) and the industrial farm poultry value chain (sector 1) in detailed in next sections.

Market governance plays a pivotal role in the industry because of traditional smallholder production (sector 4 and 3) still dominates national poultry output 60% (2006).

Market governance implies that in order to improve efficiency of the chain, it is necessary *to influence all participants in the way that changes their behaviors following our purpose*. For HPAI disease prevention and control purpose, we suggest government policy targeting on:

- Poultry farms/poultry breeding farms
 - Improve bio-security of poultry farms though technical assistances especially to change *breeding technique* of farmers in response to AI disease.
 - Carry out vaccination campaigns.
 - Improve disease surveillance plus culling and disposing infected birds.
- Assemblers
 - Ban on poultry transportation of assemblers in epidemic areas.
- Wholesalers
 - Improve bio-security of wholesalers though technical assistances.
 - Issue new regulations to impose changes in response to AI disease.
- Slaughterhouses
 - Improve bio-security of slaughterhouses though technical assistances.
 - Issue new regulations to impose changes in response to AI disease (infrastructure, technology, quarantine process, etc).
- Markets (wholesale, retail)
 - Improve bio-security of markets though technical assistances.
 - Issue new regulations to impose changes in response to AI disease (quarantine process, live poultry trading restriction, etc).
- Consumers
 - Improve consumers' awareness on safe poultry products (safe poultry certification, media and communication campaigns, etc).

Of the all links of the chain, poultry farms/breeding farms are key links that need to be focused. If we could prevent and control well the problem in the breeding activity, we minimize cost and effort for the rest activities.

We present in Appendix A an example on a supply chain that initiated and developed by STOP Avian Influenza project sponsored by USAID. It satisfies our 2 purposes, firstly it helps us to understand the way participants coordinating with each other and secondly it provides some interesting ideas for AI disease response to a market based governance.

V.2. Directed Governance

Directed governance is a feature of the commercial farmer poultry value chain (sector 2). The governance characterized by contract farming between commercial farms and large companies in which the companies have a powerful role.

Commercial farms are those having bird size ranges from 150 to 2,000 heads, moderate to high bio-security and commercial production oriented. Farms raise poultry to customer's specification, often through contract farming with an integrator company; they take full responsibility for land, labor, husbandry practices, capital investment but they also get support from the company.

In general, the terms of contracts are adaptations of contract growing agreements in industrialized countries, and modified according to the institutional environment of developing countries concerned. Contracts are mainly in the form of fixed-fee or wage contracts. Under fixed-fee contracts, the integrator provides all intermediate inputs required to produce the output. The standard input-output ratios and quality attributes are stipulated. The farmer is then paid an agreed fee in exchange for his labor, management, and use of facilities. The integrator assumes the market risks of changes in input and output prices. On the other hand, production risks impact on both parties. There were a few forward-price or profit-sharing contracts. Under these arrangements, the integrator still provides the intermediate inputs but on credit at agreed prices. The cost of these inputs is then charged to the farmer when the output is sold. A minimum forward-price of output could be guaranteed to the producer. Under profit-sharing contracts, the prevailing market price for the output at the time of sale is used. The profit is split between the two parties, with both assuming the market risks. Production risks are shared, so there is incentive for both parties to aim for maximum activity profit. Strict rules govern volume of inputs provided by the integrator and volume of output turned out by the farmer, with provisions also on some quality specifications on individual bird output. Integrators exercised proprietary rights over the technology, inputs, and output (PPLPI, Contract farming as an institution for integrating rural smallholders in markets for livestock products in developing countries: results in case countries, 2009).

Directed governance is not the only governance structure of the poultry value chain, in fact, we believe that market governance still play major role.

Not all commercial farms participate in contracts with large companies. Many of them (or maybe most of them) operate as independent actors having arm's length transactions with other actors on spot market. In this point of view, there is no different between semi-commercial farms and commercial farms. They have same inflow and outflow products. What differentiate commercial farms with semi-commercial farms could be farm size and a more complex chain. For more detail see Figure IV-5.

In addition to directed governance, the semi-commercial poultry value chain having another feature that is the involvement of large companies from providing feed, breeding chicks to distribution of processed products. A supply chain consists of large companies.

Large companies outsource breeding activity to semi-commercial farms through contracts farming. The companies may also involve slaughtering, processing, distributing activities or coordinate with other companies. In this case, governance structure is diversified. We assume market governance of a supply chain consisting of large companies is much more effective than the one of small scale actors.

The lead firm-driven chains respond well to AI disease because they require strictly conditions of prevention and control to it contracted farms and also they frequently have technical supports to their partners even in normal conditions. These chains only require a minimum support from government if necessary.

We examine directed governance structure in the poultry supply chain by using a study on contract farming with the case of Charoen Pokphand Company Ltd. See Appendix B.

V.3. Hierarchical Governance

Hierarchical governance is a feature of the industrial farm poultry value chain (sector 1). This chain characterized by large companies following a vertical integration model which they involve all activities of the value chain. The companies are rulers, nearly control everything.

However, we believe that in case of Vietnam poultry industry, directed governance are dominant coordination mechanism in the chains. In addition, market governance still appears.

Industrial farm characterized by bird size more than 2,000 heads, high bio-security and commercial production oriented. These farms are often invested by large companies such as ones in our example on Huynh Brother Poultry Company Ltd. (See Appendix C) However, there also exist independent farms. These farms could participate in contracts with large companies or operate independently.

The chains are obviously well respond to AI disease as it is a lead-firm driven chain and require minimal support from government.

VI. EFFECTIVENESS OF HPAI CONTROL POLICY TOWARD CHANGING TENDENCY AND BEHAVIOR OF POULTRY ACTORS

VI.1. Behavior Changes of Poultry Actors

Structure change of the poultry industry in Vietnam has been primarily driven by behavior changes among stakeholders participated in the value chain of poultry industry, due to either their perception and/or enforcement of policy environment.

VI.1.1. Input Providers

Input suppliers tended to change their business operation in the way that minimizes the risk of loss due to HPAI disease. For instance, before HPAI onset, input providers like feed suppliers often extend credit to semi-commercial farms, then due to HPAI outbreak, farmers lost all their flocks as a result the creditors could not receive the payback from farmers. After that, those input providers would no longer extend credit to their customers in the future (ACI, 2006).

VI.1.2. Poultry Producers

Large poultry companies that contracted poultry production to individual farmers prior to HPAI have ***moved away from contract farming to full vertical integration*** in order to increase control over all stages of production. HPAI is accelerating the structural change of Vietnam's poultry sector with government providing incentives for up-scaling and modernization of semi-industrial commercial and industrial production systems. As a result of this, between 2005 and 2006 alone, semi-industrial chicken production, despite producers leaving the sector, increased its share in total national production from 20 to 28%. The scale biases or national favor of large scale of poultry production will sharpen the disadvantages of rural small-scale producers. Larger wholesale/processors are ***increasingly linking with large farms on a contract basis or as a fully owned subsidiary***. The ban on free-range duck production around Ho Chi Minh City has forced farmers to ***either leave the sector or to relocate their enterprises to other provinces*** (Otte. J, Hinrichs. J, Rushton. J, Roland-Holst. D & Zilberman. D, 2008). Furthermore, some poultry producers have ***switched to other livestock husbandry*** during the outbreak and afterward to take the advantages of higher price of pork meat to

avoid risk of HPAI incidence (ACI, 2006). This situation also was supported by abnormal surge in pork output of Vietnam in 2005. Besides, some poultry producers **change their business but still operating in poultry industry**, as illustrated by the case of Phuc Thinh company in the North of Vietnam. Before AI onset in 2006, the company produced and sells the breeding chicks, but they could not sell chick during the AI hit as very low demand. The owner decided to start producing broiler onsite from those chicks and later on, they mainly focus on broiler chicken (ACI, 2006).

The most outstanding change probably is semi-commercial producers both for duck and chicken raising, primarily associated with change of farming practices toward more bio-secure and applying control measures in order to reducing the risk of HPAI concurrence.

Duck producers shift to use quarantined stocks, of which medium and large scale are the ones more often to buy quarantined stock rather than their small scale counterpart. Therefore, enhancing stock suppliers' capacity and give them more incentive would be reasonably effective to improve the efficiency of controlling the virus persistence in waterfowl. In addition, **duck producers both layer duck and meat duck producers started registration their duck population with local authorities** and this is official requested by government policies. However, the larger scale and layer duck producers are more aware of registration than their small scale producers. Therefore, it remains critical in controlling the small scale producers or non-commercial farms. Besides, duck producers increasingly aware of and practice **isolation** of new duck before joining them to the current flock in order to avoid virus/disease transmission from old to new heads. The behavior changes toward this practice are considerably recorded at small scale producers, from 41.4% of layer duck producers and 38.9% of broiler duck producers applying this method before HPAI to 85.2% and 69.6%, respectively in the survey of free-grazing duck in five provinces of Vietnam in 2008. Furthermore, there is low percentage of duck producers applying **disinfection** practice before the first HPAI, except semi-industrial farms but then after the HPAI hit, households are well aware of implementing disinfection. However, it is difficult to apply disinfection for free grazing ducks. Moreover, duck producers increasingly applied **vaccination** to their flock, for which layer ducks producers vaccinate their flock much lower rate compared to broiler duck producers due to their anxiety of being less productive. Finally, producers now **announced to local authorities** for the death bird instead of eating the dead ducks or destroy by themselves before. Regarding to this behavior, small scale producers and free-grazing duck farmers often less behave toward positive way for reducing HPAI risk compared to their larger scale counterparts. One of the reasons these farmers claimed is complicated formalities and procedures when informing to local authorities (SCAP, 2008).

Regarding to chicken semi-commercial farmers, there are significant **upgrading in bio-security facilities** within this group although they still keep the chickens in open door but chicken could only ran within fence border. Broiler producers **shift toward to use specific local and crossbred varieties** with clearly known origin. Importantly, farmers are **greater linking together**, being organized in a common interest group, by which they share experiences in farming practices and teach each other for advancement, and mostly the organization link them with collective actions in purchasing feed, vaccines, medicines, or selling products. Finally, farmers start **received the proper technical assistance from agents and public extension service**; and they acknowledged the beneficiary form those technical advices. Interesting examples was given by group of farmers in Dinh Hoa district - Thai Nguyen province and other common groups in Bac Giang province and Soc Son District – Hanoi (Nguyen. N.A, 2010).

VI.1.3. Slaughtering

There is a tendency of more modern or semi-modern **slaughtering house being built** to serve the tendency of consuming the slaughtered chickens as well as to prevent the spread of AI. The first form

is developing the modern slaughter house within each intensive industry farm, by which the intensive farm **registering their brand name** and their output are 100% slaughtered birds for sale in markets as either fresh chilled or frozen. The typical example is Huynh Brother Companies in the South, this has large scale of output, good cold storage, truck-delivery with cooling system and randomly test of quality by veterinary staffs (CAP, HPAI economic impact assessment in Vietnam , 2010). Besides, the semi-modern abattoirs are open to serve the semi-commercial farmers, this slaughter house is operated with less modern equipment, such as not yet having cooling delivery and cold storage, the output are fresh killed birds for immediate sale and consumed at local or nearby market but the procedure of handling the chicken is properly **taking into account the safe activities, sanitary issues and animal welfare** consideration. For example, the focused slaughterhouse in DinhHoa district – Thai Nguyen province with the assistance of STOP AI project. The slaughterhouse employs good slaughtering practices following the sequence of procedure such as (i) fasting 10 hours before slaughtering, (ii) stunning the chicken, (iii) bleeding, (iv) feather plugging, (v) washing at basin, (vi) taking organ in hanging position, (vii) burning young feather, (viii) cooling in cold room. With this model, chicken output was quarantined stamped before delivery and packing well products in plastic or spongy box with ice for conservation and sticked with owner label for traceability purpose(Nguyen. N.A, 2010). The good practices as such have been appeared in Vietnam; however, it is still very rare and can only serve very small quantity demand. The popular practice for slaughtering is till taking place at home (in rural areas and peri-urban areas) or at market (in urban area at open wet market) with any vacant place for slaughtering that slaughter find suitable.

VI.1.4. Retailers

Due to HPAI disease and the market demand for safer poultry products, there is **establishment of new sale channel directed from industrial producers**. They open “selling point” to sell frozen slaughtered poultry meat. This tendency was quite obvious in Ho Chi Minh city and/or in peri-urban of Ho Chi Minh, especially in the short term right after the big AI wave in 2005. In addition, some traders cum slaughtering in open wet market who used to involve in poultry **trading turned to trade other livestock meat substitutes** as the business was ban by authorities and also limited demand for poultry meat during HPAI. This situation was reported happening only in the short term after the outbreak, when AI was over, they still back to normal business activities (ACI, 2006).

VI.1.5. Consumers

It seems that consumers became smarter and more demanding due to AI onset in Vietnam. Consumers in some places have **shifted from buying live birds to purchasing the slaughtered birds**, instead of 95% of poultry output being purchased as live bird in the market before the first HPAI hit. The positive changes are interestingly happened in Ho Chi Minh and Da Nang Cities even after the outbreak was over and until now(MARD & MOH , 2010). Furthermore, **they purchase toward safer poultry products**. Various studies showed that consumers had reduced or completely stopped eating poultry product in response to period of HPAI morbidity. Besides, certified poultry meat and egg were sale more in the cities, implying the increasing tendency of consumers toward buying safer products (CAP & IDRC, 2009). Popularly, majority of consumers in other provinces still consume whatever supplied poultries available in market when HPAI is over.

VI.2. Assessment on Effectiveness of HPAI Control Policy toward Behavior of Actors

In order to assess the effectiveness of HPAI control policies toward changing tendency and behavior of stakeholders in the supply chain of poultry industry in Vietnam, it is necessary to recognize the goal and expected outcome of the control measures. In the short and medium term, Vietnam aims to

reduce the level of virus perpetuation, as a result reducing the number of outbreak and minimizing the risks of H5N1 transmission from poultry to human (MARD & MOH, 2010). Overall, combination of all control measures so far has achieved the goal as well as expected outcome. However, each control measure has certain level of success, of which certain control measure may work with this actor, but may not suit to other stakeholders; or it may work well during outbreak but does not work well after the outbreak over. This part gave the assessment of effectiveness of implementing each mitigation measures along the supply chain of poultry industry.

VI.2.1. Culling, Compensation and Movement Control

Initially, wide area culling was considered to be best approach to control the diseases and stop the virus circulation in early 2004. However, this measure caused huge loss for farmers although they received the compensation and also this mitigation measure had not prevented all cases of infections. Thereby, reporting process was plagued by inefficiency and incentive problems even outbreak happened in local communities and local communities are well aware of local outbreak (Henning. J et al, 2008).

Control movement is essential tool in any disease control program aiming to minimize the risk of spread of infectious agents. With the nature of millions of small flocks made this process more difficult due to limited human resource and cost effective scheme. One of the main issues here is introduction of transboundary animal disease through the border by illegal trade of infectious poultry brought from neighbor countries. Also to this, Vietnam has long land border, it seems to be ineffective at the moment regarding to control the movement of unquarantined poultry (MARD & MOH, 2010).

VI.2.2. Improved Bio-security Practices

The costs of farm bio-security enhancement are composed of investment costs required to upgrade farm facilities and recurrent costs such as the repeated purchase of disinfectants. Additional cost may arise from changes in labor requirements and changes to the farming system. In Vietnam, the cost of upgrading the bio-security of free ranging backyard production systems would surpass the benefits from potential economies of scale. The bio-security upgrading cost for small commercial farm in Vietnam probably falls into the range of \$USD 75 to 100 per farm, which was found that small backyard farmers would unlikely spend for commercial purpose (Otte. J, et al, 2009), this conclusion is practically happening in the South with small backyard duck producers, as they still follow the old practice of free grazing ducks. On the other hand, semi-commercial farms and commercial farms with already equipping facilities are likely to upgrade their farm facilities as they perceived the economic benefits from reducing risk of HPAI concurrence. Therefore, the effectiveness of bio-security implementation might be said to be enforced properly only with semi-scale farmers and larger scale, and it is not strong enough for economic efficiency for the backyard households who raise poultry for self-sustain and for additional income rather than for commercial purposes.

Live bird markets have been identified as one important source of HPAI risk and governments and local authorities are investing in improving their bio-security. Bio-security upgrading of live bird markets associated with relocation and rebuilding market outside the city, and which would cost from 5 to 10 million USD in Vietnam, a huge fiscal resource for upgrading live bird markets (Otte. J, et al, 2009). Again, the effectiveness of this policy remained questionable as once the market was built, whether traders cum slaughtering follow the proper good practice of slaughtering or not.

VI.2.3. Vaccination

Vietnam was one of the first countries to introduce large scale poultry vaccination against HPAI and it seems that this strategy has contributed to the apparent cessation of cases in poultry and humans since 2004 until end of 2010, of course the re-emergence of HPAI at small scale still existed. The total costs of vaccine, vaccine delivery, administrative and fixed costs for storage and logistics have been estimated at US\$0.06 – 0.10 per bird vaccinated (Otte. J, et al, 2009). Apparently, with 100% support from government, all small farmers were happy to vaccinate their flocks, but in return, the government has to carry the big burden of finance, this remains a big question in the long term of sustainability of vaccination spent by public resources, given that the existence of small households in raising poultry in Vietnam will be matter over next decade. On the other hand, commercial farms due to government policies and economic incentive have applied vaccination properly and effectively although they have to spend all cost related.

A number of difficulties have been encountered when implementing vaccination for ducks. As broiler duck has short life span, which resulted in the reluctance of duck owner to vaccinate twice for ducks, leading to questionable achievement of ensuring the reasonable immunity. Furthermore, mobile duck is quite popular in Vietnam, especially in the South, this makes difficult to deliver the second shot of vaccine once it was in the field. In addition, older ducks did not show up the clinical sign of infected disease like the chicken, even they were unvaccinated; inherently, farmers did not see the economic incentive to protect the older flocks from H5N1 HPAI viruses (MARD & MOH , 2010).

In short, the effectiveness of vaccination so far was implemented quite well at large scale, in the future, once government steps outside of this measure control in term of financial support for vaccination provision, the effectiveness of this strategy may need stronger enforcement through implementing economic punishment for who not vaccinate their poultry flock.

VI.2.4. Surveillance

There are two kind of surveillance: passive and active form. The passive surveillance depends on reporting of disease from poultry owners and/or local communities when they see the reason to do so. Such passive surveillance systems have limitations as poultry owners are afraid of big loss if their flock was culled, instead they might quickly sell flocks to the market. On the other hand, active surveillance programs have took several forms including actively searching for cases of clinical disease and testing of apparently healthy animals for evidence of infection HPAI viruses in high risk places such as in the large live poultry market (MARD & MOH , 2010).

Ducks and geese are particular challenging the monitoring team in surveillance. As mentioned before, infected old duck remains healthy as other uninfected duck and excrete significant quantities of virus. The regular basis surveillance must be in place for monitoring duck flock, especially the mobile ducks; otherwise sub-clinical cases went on unnoticed.

Indeed of some challenging, it seems that increasing surveillance also help to encourage the supply stakeholders taking into account the practice of control measures for risk reduction of HPAI. Compulsory regulations applied in Huynh Brother Company in the South whenever veterinary staffs visits including presence of vaccination and quarantine documents for each flock subject to slaughtering. Also, this company starts employing the simple practice of lab test like random blood test and SWAP test for monitoring (CAP, HPAI economic impact assessment in Vietnam , 2010).

VII. CONCLUSION AND RECOMMENDATIONS

Vietnam has implemented all necessary HPAI prevention and control measures with considerable empirical evidence of success. However, it is difficult to conclude that Vietnam has moved to a period of consolidation and ultimately control the disease because of there have been existing unsustainable issues in the way implementing the measures in the long term.

Based on gathered evidence, our conclusions and recommendations on each measure as following:

Culling and disposal of infected birds and suspected infection ones is a typical response to an HPAI outbreak and obviously the first reaction of Vietnamese government to control the disease. A total of 38.8 million birds were reported to have been culled during the first epidemic wave in 2004 when government decided to destroy all birds including healthy poultry within a 3 km radius from affected farm with compensation for farmers. Since then, the measure implementation has experienced significant changes over time in terms of disposal radius and compensation level to gain cooperation of poultry growers. There have been inefficiency and incentive problems relating to the measure. However, we see no opportunity for further intervention.

In conjunction with culling and disposal, disease surveillance of poultry operations to monitor birds for disease and immediately report any suspected cases of AI is important to improve efficiency of disease control. It includes passive and active form. The passive surveillance depends on reporting of disease from poultry growers or local communities when they see a reason to do so. Its biggest limitation is that poultry growers do not report due to afraid of big loss if their flock was culled. This largely depends on compensation rate and awareness of local communities. On the other hand, active surveillance has several forms including actively searching for cases of clinical disease and testing of apparently healthy animals for evidence of infection HPAI viruses in high risk places such as in the large live poultry market. Large investment by government and international donors has been provided to improve quality of veterinary services. However, it will take many years before Vietnam can meet all quality standards for veterinary services defined and measured in OIE's veterinary assessment process. The cost of strengthening veterinary services and improving disease investigation capacity in Vietnam is about 30 million USD over a 5 year period. In addition to veterinary services, major investment has been made in veterinary laboratories including training of staff, new sophisticated equipment, reagents for testing and laboratory facilities. National and regional laboratories are now well equipped to diagnose avian influenza, to conduct appropriate surveillance testing for this disease and to diagnose a range of other diseases. Quality management systems are being implemented to provide confidence in the results generated. We believe that further financial and technical supports are essential to improve efficiency of the disease surveillance measure.

A first round of a government-led mass vaccination campaign was introduced in Vietnam in autumn of 2005. A second round of the vaccination campaign was conducted in spring and since then vaccination has been held twice yearly in October and April. National vaccination campaign aims to cover 80% of poultry heads. The mass vaccination measure would burden on government budget and there is an increasing problem of maintaining the willingness of farmers to comply with vaccination requirements. There is an alternative vaccination strategy being trialed in the GETS project by FAO Vietnam which is an age based vaccination strategy targeted at ducks. It is piloted in 5 provinces of Vietnam which are Nam Dinh, Ninh Binh, Soc Trang, Hau Giang and Quang Binh. The strategy had achieved higher efficiency by a reduction of total cost as well as better control of risks of HPAI outbreaks. Therefore, Vietnam should consider switching from mass vaccination campaign to targeted vaccination one.

Improved bio-security practices prevent exposure to any animals or other items potentially contaminated with AI are vital for preventing and controlling the spread of the disease. Strict bio-security practices include closed poultry housing, ensure wild birds cannot access poultry feed and water

supplies, isolate new birds or avoid their introduction into existing flocks, limit access to poultry houses and thoroughly clean all clothing, shoes, equipment and vehicles before and after coming in contact with birds and finally restrictions on transportation and marketing, especially at live bird markets. Vietnam has issued many legal documents to regulate the application of bio-security measures to all actors participating in the value chain however we strongly believe that it is insufficient to improve sustainably bio-security condition of the industry. Restrictions on transportation and marketing poultry products through movement control or ban live birds market policies could be easily implemented and caused immediate results. But if we want to change the way actors running their business every day such as husbandry practice of poultry farms in response to AI disease then obviously only setting up regulations or instructions is not sufficient. Veterinary authorities must be given more **legal power** for enforcement of bio-security practices, and local veterinary authorities should be independent from the provincial administrative authorities (for instance, the Provincial People’s Committee) and organized at **regional level**. In addition, the actors need technical assistance with “detailed” solutions rather than “too general” solutions given in the legal documents. New regulations to impose changes in behavior of each actor especially poultry farms, slaughterhouses and markets, in the value chain in response to AI is necessary but need a **technical assistance program** to support for their changes.

We strongly recommend that improved bio-security practices are the long term solution to combat AI disease.

Vietnam needs a systematic approach to influence all actors in the value chain. We know that market governance is a coordination mechanism that dominates Vietnam poultry industry. It implies that in order to improve efficiency of the chain in response to AI disease, it is necessary *to influence all participants in the way that changes their behaviors following our purpose*. We suggest government policy targeting on:

- Poultry farms/poultry breeding farms
 - Improve bio-security of poultry farms though technical assistances especially to change *breeding technique* of farmers in response to AI disease.
 - Carry out vaccination campaigns.
 - Improve disease surveillance plus culling and disposing infected birds.
- Assemblers
 - Ban on poultry transportation of assemblers in epidemic areas.
- Wholesalers
 - Improve bio-security of wholesalers though technical assistances.
 - Issue new regulations to impose changes in response to AI disease.
- Slaughterhouses
 - Improve bio-security of slaughterhouses though technical assistances.
 - Issue new regulations to impose changes in response to AI disease (infrastructure, technology, quarantine process, etc).
- Markets (wholesale, retail)
 - Improve bio-security of markets though technical assistances.
 - Issue new regulations to impose changes in response to AI disease (quarantine process, live poultry trading restriction, etc).
- Consumers
 - Improve consumers’ awareness on safe poultry products (safe poultry certification, media and communication campaigns, etc).

Of all the links of the chain, **poultry farms/breeding farms are key links where focus is needed**. If we could prevent and control the problem in the farms, we could minimize cost and effort for the rest of the activities.

Works Cited

ACI. (2006). *Economic Impact Ssessment of HPAI related biosecurities on Vietnam poultry sector* .

ACI. (2006). *Impact of AI on poultry sector restructuring and its socioeconomic effects*.

CAP & IDRC. (2009). *Socio-economic impacts of HPAI outbreaks and control measures on small scale and backyard poultry producers in Asia*.

CAP. (2010). *HPAI economic impact assessment in Vietnam* .

CAP. (2010). *HPAI economic impact assessment in Vietnam*.

Gilbert. M, at el . (2008). *Ducks, Rice and People - the Key to HPAI Risk in the Mekong Region. A Collaborative Research Project funded by DFID, implemented by FAO, RDRC & RVC*.

GSO. (2004).

Henning. J et al. (2008). Risk factors and characteristics of H5N1 HPai post vaccination outbreaks. *Veterinary Research* .

Hien, N. T. (n.d.). Avian influenza in Vietnam: situation and lessons learned.

Ifft. J, Otte. J, Roland-Holst D., & Zilberman . (2008). *HPAI control from a demand Side perspective*.

MARD & MOH . (2010). *Avian Pandemic Influenza - Vietnam experiences*.

Nguyen. N.A. (2010). *Analysis of economic performance of Stop Avian Influenza Project Poultry Supply Chains in the North of Vietnam*. Hanoi.

Otte. J, et al . (2006). *HPAI control measures and household incomes in Vietnam*. Project: Pro-poor livestock policy initiative .

Otte. J, et al. (2009). *Impacts of Avian Influenza on Poultry Production in Developing Countries. Project: Controlling Avian Flu and protetcing People's Livelihoods in the Mekong Region*.

Otte. J, Hinrichs. J, Rushton. J, Roland-Holst. D & Zilberman. D. (2008). Impacts of avian influenza virus on animal production in devleoping countries. *Perspectives in Agriculture, Veterinary Science, Nutrition and Natural resources* .

PPLPI. (2009). *Contract farming as an institution for integrating rural smallholders in markets for livestock products in developing countries: results in case countries*.

PPLPI. (2008). *Poultry supply chains and market failures in northern Vietnam*.

PPLPI. *The poultry sector in Vietnam: prospects for smallholder producers in the aftermath of the HPAI crisis*.

Robert H. Beach, Christine Poulos, Subhrendu K. Pattanayak. (n.d.). Prevention and control avian influenza: a view from the farm household.

S. Burgos, J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst. (2008). *Poultry, HPAI and livelihoods in Vietnam - a review.*

SCAP. (2010). *Cost effectiveness monitoring survey.*

SCAP. (2008). *Nghiên cứu đề xuất các giải pháp nuôi vịt chạy đồng an toàn và bền vững ở Đồng Bằng sông Cửu Long.*

Sims. L & Do. H.D. (2009). *Vaccination of poultry in Vietnam against H5N1 Highly Pathogenic Avian Influenza.*

Sproul. T et al. (2009). *Economics of Avian flu Policy. Project: Controlling Avian flu and Protecting People's Livelihoods in the Mekong Region.*

Vu, T. *The political economy of avian influenza response and control in Vietnam.*

APPENDIXES

Appendix A

ATK Dinh Hoa Free Range Chicken Supply Chain.

Source: Analysis of economic performance of stop avian influenza project' poultry supply chain in the north of Vietnam, Ngoc Anh NGUYEN, 2010.

The free-ranged chicken supply chain in Dinh Hoa district - Thai Nguyen province has been initiated and developed since 2008 by the STOP Avian Influenza project with ASVELIS as a coordinator. STOP Avian Influenza is a project, which has been conducted in 45 countries and financed by the Agency of International Development of the United States (USAid) with the objective of enhancing capacity to prevent, detect, react and stop avian influenza cases, as well as other related disease to minimize economic lost and increase nutrition of poultry products. Since 2008, ASVELIS has been the coordinator of the STOP Avian Influenza project in Vietnam and Thailand. ASVELIS - The Asian Veterinary and Livestock Services is a private company dedicated to the provision of services in the animal sector with a primary focus on South East Asian countries. Number of project participants reached 21, in which 1 is nursery, 1 is layer farm, and the rest are broilers. The project also set up a slaughterhouse to serve the stakeholders of the supply chain first, and then, according to the business of the slaughterer, it can be used to provide services to others. All these poultry stakeholders are organized in an interest group, which link them with collective actions in purchasing feed, vaccines, medicines, or in selling products.

Dinh Hoa supply chain provides four main kinds of poultry products: chicks of 21 days old, carcass, live-weight chicken and eggs.

The value chain of chicken in Dinh Hoa district, Thai Nguyen province, supported by STOP AI project can be described as the followings:

The nursery activity in ATK Dinh Hoa supply chain is responsible by Mrs. Nguyen Thi Tam, the leader of the supply chain. With the advice of project expert, Mrs. Nguyen Thi Tam usually buys chicks of Ri or Mia cross breeds at Phuc Thinh company, a well-known chick supplier in Vietnam and raises chicks from 1 day old to 21 days old. The price of 1 day old chick is from 6,000 to 6,500 VND/chick. Then, she sells 21 days old chicken to the broilers in the area at the price of 14,000 to 15,000 VND/chick. During the period of nursery, in addition to feed and lighting, vaccination, density, and sterilized area to get in and out the shelters are very respected to prevent poultry disease in general and avian influenza in particular. In addition, she has two main breeding shelters, with three separated areas for ill or weak chicks.

The breeds Ri and Mia are chosen since they are slow-growth, familiar with local people and have been long time bred with traditional free-range technique. However, for the purpose of better productivity and lower production cost, it is recommended to use Ria or Mia cross breeds, which allow farmers to get back their investment only after 90 days, not more than 100 days as before. During nursery period, the chicks are well kept warm in brooding area, where heat is provided by system of lights to protect them from bad weather and outside nuisance.

A monitoring book is used to collect the data of nursery activities, including not only the technical follow-up such as number of chicks purchase, feed consumption, medicine, vaccination cost, but also an accurate description of the veterinary activities for the purpose of disease control.

Up now, Mrs. Nguyen Thi Tam not only provides chicks for farmers of the STOP AI supply chain in Dinh Hoa district- Thai Nguyen province, but also other farmers in the district and other districts nearby. However, she always puts STOP AI farmers in priority to provide chicks of the best quality. In addition to chicks, she is also feed and medicine supplier and always enthusiastic to provide technical assistance or consultancy to farmers so that they can raise chicken best.

The nursery activity is taken all the year round since the market for it is quite stable; however, it extremely develops during the period of September and October to satisfy high demand during the Lunar Calendar Festival in Vietnam.

The breeding of chicken for carcass is carried out by 19 farmers in Dinh Hoa district, Thai Nguyen province. The breeders of the supply chain are those, who either had never raised chicken before, or had raised only a small number of chickens before, under 50 chickens and mostly for the purpose of family consuming, rather than selling out. These farmers follow strictly the production plan suggested by Mrs. Nguyen Thi Tam since she is the person who collects their chicken at the end of the batch. Therefore, she catches up with the number of chicken demanded and guides the broilers to take a certain number of chicks. Otherwise, it is very difficult for them to sell on their own. The broiler farmers understand this quite well and follow the guidance of Mrs. Tam. They usually buy chicks of 21 days old from Mrs. Nguyen Thi Tam to raise until they achieve the live weight of 1.6 to 2 kg or 1.2 to 1.8 kg of carcass, equivalent to 90 days old. In general, this weight is quite low comparing to the colored breeds with a high level of selection. However, it is crucial to note that Vietnamese people prefer small chicken of about 1.5kg. Therefore, the weight of Ri or Mia cross bred chickens can meet with the demand and satisfy the taste of Vietnamese population.

Most of shelters used to raise chicken are built on a solid floor, with wall made by bamboo and roof made by palm leaves, which is very well-ventilated for chickens. Of course, there are also some with bricks, but not so many. All the broiler farms have running areas for chickens with fence. For some, the running areas are very beautiful with grass and trees, which allow chickens walking and playing happily.

Free range chicken raising is a traditional breeding technique that most of small and medium farmers apply since it allows them to take advantage of their by-products for breeding and at the same time produce chicken with tough meat, which is the favour of Vietnamese consumers. However, for the purpose of keeping this tradition, and increasing productivity, the breeding technique here is a combination of controlled free range and semi-industrial techniques, meaning that it uses semi-solid shelters for chickens, industrial feed at the beginning stage to fatten chicken faster, but natural feed at the end, such as maize and rice to reduce the anti-biotic residue in meat at the time of selling.

The farmers in Dinh Hoa district, Thai Nguyen province follow strictly the good husbandry practice recommended by the STOP AI project, in which they keep maximum 10 chickens/m² in the coop, and 3 chickens/m² in the running area. In addition, they always used boots sterilized before and after getting in and out of poultry shelters. All poultry activities are recorded, including current weight of chicken, feed consumption, the use of medicine, veterinary products, mortality, and the sale of their chicken with price, quantity and time, etc. The follow-up requires at least weekly record of data, and by the way weekly visit of the farms. This helps themselves and the project easily follow their activities, and recommend them with useful information related to poultry production.

There is only a layer farm in the ATK supply chain and carried out by the family of Mrs. Hoang Thi Long, a poor household of the district with 4 children. This farm holds 100 pullets of high breed (Isa Brown). These pullets of 17 weeks old, of about 1.3 kg/pullet, already vaccinated, were bought from a

prestigious company (Phuc Thinh company) to reduce the risk for layer farms when raising chicks of 1 day old until they lay egg. Similarly to nursery or broiler activities, the layer farm also applies free range technique to raise their chicken, good animal husbandry practice developed by the project as well as uses batch monitoring book to keep all details of feed consumption, veterinary cost, weight, mortality, productivity per day, etc. Especially, the feed used for the pullets is without antibiotic. The breeding density applied for pullet is 5 chickens/m² in coop, and 1 chicken/m² running area. In addition, they have access to running area everyday since they are 6- weeks old. Then, just about 2 or 3 weeks after being purchased, the farmers start to have income from layer activity when their eggs get the weight of 55g/egg. These pullets can give 97 eggs/ day and then the productivity can reduce to 75% after 1 year. However, they can reach the average productivity of 85%, meaning that 85 eggs per day. Moreover, at the end of the batch (1 year), the layer farms can get back their investment in pullets since they can sell these pullets to restaurants, canteens, retailing shops or individual customers because Vietnamese consumers are in favor of tough meat of pullets after production cycle. The layer activity brings a stable income for the family and makes up 70% of their total revenue (the rest comes from cultivation and wage labor). It can even provide this poor household with a source of nutrition.

While slaughtering at home and at markets seems popular in Dinh Hoa district, Thai Nguyen province, the model of a focused slaughterhouse developed by the STOP AI can be seen as a success since it allows to prevent the outspread of avian influenza as well as other poultry related disease and improve collective action of members breeding chickens in the interest group. The slaughterhouse is quite far from the location of local inhabitants (500m). It is built solidly with good systems of electricity, water and sewerage. It is well designed with clear separation of dirty and clean areas, hot and cold zones. It gets much support from the project in terms of equipment that can ensure safety and sanitation. All these facilities are authorized to Mrs. Nguyen Thi Tam, who invests in land and construction of building for administration. It employs good slaughtering practices: (i) fasting period before slaughtering 10 hours; (ii) following relevant slaughtering procedure in every slaughtering session; (iii) ensure chickens with quarantined stamped before delivery; (iv) respecting good refrigeration of the carcasses; (v) packing well products in plastic or spongy box with ice for conservation and tagged with owner's label for the purpose of traceability. The water for slaughterhouse is as clean as drinking water. During slaughtering, relevant solutions of pest control and anti-disease affection are applied; one ward flow is respected to avoid the cross- contaminations between chickens, carcasses and workers. After each slaughtering session, all the premises and equipments are cleaned carefully while poultry products are well preserved in cold chain and safe transportation to the market. Although it is prohibited, the slaughtering activities at home and at market still take place popularly and illegally, making poultry customers confused of safe and unsafe products, hygiene and not hygiene. Under that circumstance; still the workers of Dinh Hoa supply chain respect very well sanitary and safe requirements during their slaughtering session, which make them more confident in the quality of their products.

The slaughterhouse of ATK supply chain in Dinh Hoa district has 17 slaughtering sessions per month, with averagely 50 chickens per slaughtering session. The workers of slaughterhouse include some broiler farmers of the supply chain, all members of Mrs. Nguyen Thi Tam's family, for example her husband, sons and daughters in law, and also some of her relatives. These workers are well trained with slaughtering techniques and now very familiar with slaughtering equipments. So, the work in slaughterhouse generate stable jobs for those who either stay at home, going outside to work as wage labor, or just breeding chickens and cultivate rice and crops. Depending on the quantity of chicken to be slaughtered, the number of workers may vary from 2 or 6. The workers who have been well trained with good slaughtering technique usually give training for others; who can replace them in case necessary.

The waste, consisting of blood, feather, waste water and fecal matter, generated by the slaughtering process is sent to a waste water treatment basin before going to drainage system. However, this waste treatment is still in simple manner. Hence, waste treatment need to be taken care as soon as possible; particularly when the slaughtering scale becomes bigger.

The slaughterhouse here serves not only chicken of the STOP AI supply chain, but also others chickens in the district, depending on the output market of the slaughterer.

In addition to the function of a slaughterer, Mrs. Nguyen Thi Tam also plays the role as the collectors and traders of chickens in the district. She collects chickens from broiler farms to slaughter and then sell it to restaurants, hotels, and retailing shops. At the same time, she provides feed, medicine and advice or support for breeders. This allows broilers to buy input for their breeding on credit and then sell their chicken back to Mrs. Tam.

Appendix B

Charoen Pokphand Company Ltd.

Source: 30 cases of contract farming: an analytical overview, MAP.

Charoen Pokphand (CP) is an international livestock corporation whose head quarter locates in Bangkok, Thailand. It has branches in over 20 countries, with a variety of products, such as breeds, animal feed, fertilizers, seeds, aquaculture, land, telecommunication, banking, etc. CP first entered Vietnam in 1992 and invested 5 million USD to open the first two branches in Dong Nai. In 1996, the corporation expanded to the North, with an investment of 30 million USD to build animal feed factories, breeding chicken farms, egg-hatching factories, and livestock tool manufacturing factories.

Charoen Pokphand company Ltd. Vietnam, which belongs to the CP Corporation, was founded and built in Xuan Mai town, Chuong My district, Ha Tay province, with an area of 25.5 ha. The animal feed factory has a capacity of 216,000 tons/year; the breeding chicken farm can hold 120,000 chickens whose eggs are transferred to the egg hatch factory to produce 12 million meat chickens and egg chickens annually. The company has now expanded to raise breeding pigs and baby pigs. 7 additional branches were opened in Hanoi, Hai Phong, Quang Ninh, Thanh Hoa, Nghe An, Thai Nguyen, and Ha Nam. The company has 488 workers and sells all of its products inside Vietnam. In 2004, its total revenue was 1000 billion VND. CP company Ltd is an absolute success case in contract farming. The company started the contract in 1997, before Decision 80, and now has 500 contracted households for pigs and chickens. No household has terminated the contract with CP, except for rare cases of family crisis.

As a large company, CP needed to find a stable source of input. It looked for areas with a suitable policy environment for livestock and with some previous commitment with the livestock industry. After identifying the area, commune officials helped the company find diligent, honest, and patient households, with experience in pig or chicken raising. The contract with CP has not only ensured a stable output market for farmers but also expanded their scale of production and increased their income consequently. To encourage farmers to join the contract, the company agrees to provide the breeds, animal feed, and veterinary medicine. Farmers, on the other hand, are responsible for renting land for the farm and providing labor. The investment for the farm is vast. According to Mr. Tran Van Chien, a pig farmer, his family invested 3.5 billion VND to rent land, build the farm, and raised 1,600 pigs. To secure this capital, Mr. Chien borrowed from the district's bank quite easily using the contract with CP as insurance. With the high income from the contract, Mr. Chien has paid back the loan within 5 years. Besides, from a small farmer, he now has a large house and a car. On the farmers' side the large investment into the farm also acts as a commitment to the contract since terminating the contract would mean the farm is wasted. Similarly, on CP's side, the investment into breeds and other inputs acts as a commitment since not buying the farmers' output would mean all their invested inputs are wasted. Currently, an average household raises 6000 chickens or 600 pigs, depending on their ability.

We examine the case of the pig contract as the chicken contract is similar in terms of arrangements and management and only different in terms of price and quality. In general, all of CP's livestock contracts are written in details which indicate clearly the responsibilities of both sides and the fine and bonus system for pig quality, feed consumption, farm management, and farm condition. The farms are usually located on the farmers' land but have to be constructed according to CP's standards. These are meticulous standards to ensure epidemics cannot be spread and the livestock is raised in the best condition. The contract lasts for 5 years and is divided into 2 kinds: breeding pigs and baby pigs . We examine the case of the baby pig contract, in which the company provide the farmers with baby pigs

and the farmers will return these pigs after raising them for 5 or 6 months or when the pigs reach 90 to 120 kg. During the contract, CP assigns a technical officer to stay right at the farm to instruct and supervise pig raising. The officer not only ensures that the pigs are taken care of according to CP's standard but also score the farmers' management ability to take into account in the bonus and fine system. With the aforementioned share of investment, CP would invest approximately 300 million VND and the farmer, 200 million VND for each pig farrow. An average baby pig weighs about 4 kg and age from 14 to 21 days when entering the farm. When the pigs are returned to the company, each kg gained would pay 500 VND. Additionally, a death rate below 4% would pay at most 200 VND/kg. Feed consumption higher than standard would fine 155 VND/kg while feed consumption lower than standard would provide a bonus of 300 VND/kg. The company has other bonuses and fines for farm management as well as electricity costs and other above-standard farm maintenance. This has motivated many farmers to improve their farms. Some even have closed farms with a cooling system and therefore, industrialized pig raising. During natural disasters or inevitable epidemics, CP will bear the entire cost since all variable inputs, such as breeds, feed, veterinary medicine, etc. are provided by the company. As a result, the farmers cannot ask for compensation. The company even holds the right to change the farm arrangement and raising method, stop pig importing, or slaughter the pigs to prevent the epidemic from spreading. The farmers have the responsibility to comply with the proposition.

Appendix C

Huynh Brother Poultry Company Ltd.

Source: Pilot certified free range duck supply chains for Ho Chi Minh City: Interim report, SCAP Team, 2009.

Huynh Brother Poultry Company Ltd is the largest poultry company in the South of Viet Nam. It has own processing facilities as well as poultry farms in rural areas. This company owns Dai Nam Slaughterhouse, and has an extensive marketing network in Ho Chi Minh City. In HCM City Huynh Bros Company is the prominent supplier of duck meat to supermarkets in the South, and operates their own poultry shops throughout the city. On average this company provides 12,000 chicken and 6,000 ducks per day to the market in HCM City (Pilot certified free range duck supply chains for Ho Chi Minh City: Interim report, SCAP Team, 2009). The company has set up a 3 ha self-contained duck raising zone in Dong Thap with 20 farms, 5,000 ducks per farm. It has implemented a form of duck safety confirmation in which each slaughtered duck is tagged with a plastic tag to prove that it is safety and hygiene.

Although the company concerns about food safety and hygiene however its customers (individuals, restaurants, hotels, super-markets, etc) do not really highly prioritize quality [safety and hygiene] vis-a-vis price, according to Mr Chung, director. It need a lot more time and further efforts to change consumers' habit and awareness (SCAP Team field note for "Pilot certified free range duck supply chains for Ho Chi Minh City" project).



**Policy Analysis of HPAI strategy including analysis of collaboration
and partnership between public and private sectors**