

# POULTRY SUPPLY CHAINS AND CHALLENGE FACING THE POULTRY SMALLHOLDERS IN HANOI SUBURBAN

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The Highly Pathogenic Avian Influenza (HPAI) caused by H5N1 virus in Vietnam from early 2004 with millions of birds culled. A question has been raised: how could Vietnam limit this epidemic? This research aims to address this question and to improve the income of small poultry producers through an identification of poultry production systems and the supply chains with their various constraints, including the diseases and to analyze the explicative factors of the poultry development at local level. The research had been conducted by interviewing and production record keeping system at the household farms which have poultry production at different scales in Hanoi Suburban from December, 2008 to November, 2009. There are four poultry production systems (1) integrated poultry production system with a good bio-security level; (2) layer/reproductive poultry production system at the semi-commercial scale with the low to average bio-security level; (3) broiler bird production system at the semi-commercial scale with the low to moderate bio-security level and; (4) backyard poultry production system with low bio-security level. Only the chicken flocks in the system 1 and the layer/reproductive hens in the system 2 are strictly vaccinated with good calendar. This research showed that the scientific knowledge of farmers is still limited which causes unsettled economic outcome in these systems. Therefore, poultry production in the studied region is facing grave difficulties. In order to have a sustainable development in the coming years, it is necessary to equip farmers with good scientific knowledge or to support them to build improved poultry production systems such as a practical system for disease prevention and food safety, the HACCP.

**Keywords:** poultry production, livestock farming systems, epidemic risks, economic efficiency, Hanoi Suburban

## 1. OVERVIEW OF POULTRY PRODUCTION IN VIETNAM

The average growing rate in Vietnam's agricultural production was about 5% per year from 1990 to 2007. In which, the growing rate of animal products was about 9.5% in the period of 2000 - 2009. So, the value of animal production reached 16 thousand billion VND in 1995, contributing 19% to agricultural production value, and increased to 98 thousand billion VND in 2008, making up to 27% of the structure GDP of agricultural production value. This has contributed to average GDP per capita from 200 USD in 1986 to 1,000 USD in 2009 (MARD & GSO, 2009). However, rice production and animal production at small scale are mainly run by farm households in Vietnam. Poultry production remains small scale with low investment, and is for self-consumption demand in the households. And the bio-security level in poultry production is very low with different animal species in the same household in densely population zones. According to a research in Red River and Mekong Deltas, there are 80% of households raising chickens and 74% of households having ducks and 53% of farms who raise both chickens and ducks on a limitation surface (Vu Dinh Ton et al. 2008).

The Vietnam has about 8.3 millions of small households (70% of households) that characteristically have low productivity for self-consumption. The average scale of poultry production is only 32 birds per household (MARD/DLP, 2008). Animal production at small and semi-commercial scale



with a limited knowledge of farmers has considered an important agent caused by infection of vectors of animal disease, particularly poultry production at semi-commercial scale (Phan Dang Thang et al. 2009). At the end of 1990s, some models of poultry production at (semi-) commercial or industrial scale have been established in the country. Although poultry production at commercial scale has still occupied a limited rate, the output of this scale occupied about 35% (MARD, 2008). Poultry production at commercial scale is nowadays facing difficulties of the animal production surface, far away from densely populated areas (crowded population density), capital for production, and lack of knowledge and management capacity of farmers. In fact, poultry production at small and semi-commercial scale, the farmers could quickly restore their animal production because they are least influenced after each epidemic disease of HPAI. But the commercial farms were loss-marking and stop their production during several months (Phan Dang Thang et al. 2009).

Poultry production has effectively contributed to the income rate of households, 19% of total income in household after pig production, which helps decrease the rate of mal-nutritive children in rural areas. The average growing rate of poultry population continuously increased from 1990 - 2003 (around 7% per year), leading to the poultry population of 254 million of heads in 2003, an increase of 28% compared to 2000. However, early 2004, the influence of HPAI, originated from H5N1 virus due to H5N1 occurred in early 2004 when millions of birds culled, caused a decrease in poultry population (from 14% in 2004 to 16% in 2006) (GSO, 2007). Furthermore, the average growing rate of birds was only 1.5% in the period of 2000 - 2007. Whereas from 2000 - 2003, this average growing rate reached to 9% per year. This leads to large socio-economic impacts. The loss caused by H5N1 virus was estimated about 3,000 billion VND (Vu Dinh Ton et al., 2008; M. Peyre et al., 2008). The risk of avian influenza on the poultry flock was large, particularly on the backyard poultry production systems (FAO, 2005). The Red River Delta is a region having the highest quantity of poultry flock in the whole country, making up about 30% of total flock (Vu Dinh Ton et al., 2008). From 2006, the poultry herd was restored. In 2008, the poultry herd had about 247 millions of heads, increasing to 9% compared with 2007. In 2009, the poultry flocks had 280 millions of heads, increasing to 13% compared with 2008 (GSO, 2009). Poultry production represents about 19% of total income of household; and the poultry meat occupies 15% of total meat consumption in families (VLSS, 2006; MARD, 2008). The quick growth of poultry production stimulated the other industrial development such as feed processing industry. In 2006, the output of feed reached 6.2 million tons, increasing to 16% compared to 2005 and occupied 43% compared to the total demand of animal feed. Therefore, the animal production more and more plays an important role in the GDP structure of agricultural production. However, the animal production is facing several difficulties such as epidemic diseases of HPAI on poultry, porcine reproductive and respiratory syndrome or food and mouth disease on pigs and cattle, etc. In addition, the animal production in the country has to face competition of imported meat products; and these domestic animal products that are boycotted by consumers as epidemic diseases.

Hanoi's Suburban area plays an important role in supplying meat for Hanoi capital and providing chicks and ducks for other provinces in the whole country. From early 2004, the producers had to adapt in the context of epidemic of the avian influenza for better responding the demand on the market. In fact, the research on the poultry production basing on system approach and commodity chains is still limited, particularly the relation between the poultry production systems with the epidemic diseases. Thus, this research aims to analyze the explicative factors of poultry development at local level in Hanoi Suburban area located in the heart of the Red River Delta through an identification of poultry farming systems with their various constraints, including the diseases in this province. In addition, this research aims at identifying the major risks of epidemic disease caused by H5N1 virus, the response of breeders facing the epidemic disease.



## 2. METHODOLOGY

Households who having poultry production at different scales in Phu Xuyen and Chuong My Districts which represents the main poultry production region in Hanoi Suburban area, were selected for this research. In each district, we selected 2 - 3 communes basing on the agro-ecological patterns of the region and the diversification of poultry farming systems. This research was conducted from December, 2008 to November, 2009.

The research began with the collection of poultry production data through official reports of the Department of Livestock Production (DLP), the FAO, the GSO, the Services of Veterinary, the Stations of Veterinary and from the discussions with the key persons and local authorities at the province, districts and the leaders of communes or villages in these research zones for a comprehensive understanding the poultry production in this province.

The various poultry production systems and sub-systems were then identified; the research used random stratification method to select households who have poultry production. Over 270 poultry farms and veterinary agents were eventually interviewed, using a closed structure questionnaire. Information collection allows the characterization of the poultry production (sub-) systems by the scale of breeding. About 160 of poultry farms at different scales were chosen for production record keeping system according to a production cycle in the same farm conditions. In addition, the other economic activities in the farm-households such as cropping, animal production and off-farm activities... are also collected in this research for more understanding the household scales and their economic levels.

The price of some products concerning the poultry production such as industrial feed, maize, paddy, local broiler chicken, industrial broiler chicken, broiler duck, broiler Muscovy duck, chicks/ducklings, etc. in these zones were also collected every two days per week in the period of research. Then, monthly average prices of these products are calculated.

The principal income of the farms are calculated such as cropping, poultry production, other animal production at different scales and the income of off-farm activities such as hired labour, handcraft, transformation of agricultural products, commerce and monthly salary, etc. The survey data of 160 poultry farms from production record keeping system is analyzed by using MS Excel 2003. Financial analysis method is based on the concept of value-added, the whole production processes involves the flow of inputs and outputs. The income of off-farm activities is the net income by Vietnam dong coming from hired labour, handcraft, transformation of agricultural products, monthly salary, etc. per farm household a year.

## 3. RESULTS AND DISCUSSION

### 3.1. Highly Pathogenic Avian Influenza (HPAI) caused by H5N1 virus on birds

Highly Pathogenic Avian Influenza (HPAI) caused by H5N1 virus on poultry is the first great challenge for poultry production in Vietnam with millions of animals destroyed. This is great influenced on socio-economic condition in the country, particularly in the period of 2003 - 2005. At the end of 2003, the HPAI has been officially announced. Up to this time, there are seven outbreaks of HPAI in Vietnam causing more than 54 millions of poultry heads to be dead and culled in almost of North and South provinces, which occupied about 20% of total poultry population. In which, the first outbreak was happened from December, 2003 to March, 2004 in 57/64 provinces and cities with roughly 44 million of bird heads were death and culled (FAO, 2009; DLP, 2007; DAH, 2010). This epidemic disease has caused enormous loss-marking for this poultry production and other economic activities.

Nowadays, the small HPAI outbreaks are still announced in some provinces, particularly in North provinces. To deal with HPAI, the Vietnam Government and other international organizations have



proposed several measures to reduce the losses caused by H5N1 virus and to prevent the expanding of this epidemic disease. However, HPAI on birds still has occurred in most provinces caused by small production scale with low bio-security level situated in densely populated areas. The farmers still have not prevented by active measures of vaccination for the poultry. The poultry are not normally vaccinated for the next flock if the disease did not occur in previous flocks. In addition, legal procedures related to animal production, veterinary hygiene, transportation and slaughterhouses are still very limited. The legislation for disease prevention applies passively in animal epidemic disease and authorities have usually interested in problems only when epidemic disease had happened. Veterinary human resources are still limited in all communes and villages. This leads to limitation of information of epidemic diseases in order to apply epidemic prevention measures. Thus, it is necessary to have the better legal means for establishing animal products with good traceability.

### 3.2. Typology of poultry production systems

**Table 1. Typology of the poultry production systems**

| Poultry farming systems (FS)  | Sub-systems                                 | Farms | Percent of farms** (%) | Areas of (sào*)  |           |
|---|---|-------|------------------------|------------------|-----------|
|   |   |       |                        | Plant production | Pond fish |
| Chicken integration by contract with high bio-security (FS1)                              | Young hens (FS1a)                           | 5     | 0.2                    | 6                | 1         |
|   | Broiler chicken (FS1b)                      | 15    |                        | 7                | 3         |
| Layer/reproduction poultry at semi-commercial with minimal to moderate bio-security (FS2) | Layer hens (FS2a)                           | 21    | 5                      | 5                | 12        |
|   | Layer ducks (FS2b)                          | 28    |                        | 12               | 15        |
|   | Mixed of reproductive hens and ducks (FS2c) | 24    |                        | 8                | 6         |
| Broiler production at semi-commercial with low to minimal bio-security (FS3)              | Broiler chickens (FS3a)                     | 17    | 15                     | 11               | 4         |
|   | Broiler ducks (FS3b)                        | 18    |                        | 7                | 5         |
| Village/backyard poultry production with low bio-security (FS4)                           |   | 32    | 80                     | 8                | 3         |
| Total   |   | 160   |                        |                  |           |

\* Sào is an area unit used in rural areas of the North of Vietnam. 1 sào is equal to 360m<sup>2</sup>

\*\* Calculation by the data of General Statistics Office of Ha Tay Province and Statistical Offices of Phu Xuyen and Chuong My Districts (2007)

The scale of poultry breeding and the type of poultry races are really diversified and complicated in each ecological zone in the all districts of Hanoi Suburban. Most of economic activities of surveyed households are partly from poly-culture and animal production. Crop production aims to satisfy the demand of self-consumption and at buying a small overproduction. The cash income comes from animal production and extra-agricultural activities (Vu Dinh Ton et al., 2010). Investigation and results of production record keeping system of 160 households allow us to characterize four main poultry production systems according to the type of production and the risk level of epidemic disease which are presented in Table 1.

+ *FS1*: The farming system of chicken integration production by a contract between farmers and chicken production enterprises with high bio-security level. The enterprises supply a day old chicks,



chickenfeed, vaccines, chicken drugs and technicians. The farmers have to build the hen-house at their area and have to raise chickens according to a good procedure provided by enterprises. The farmers received their wages based on their production results. The quantity of poultry of this system is still very limited in the whole country but this product is characteristically a commercial production model with high potential productivity such as ISA Brown, Sasso, Cobb 707. There are two sub-systems in these systems which are (FS1a) the production of young hens, being raised about 4 months; and (FS1b), the production of industrial broiler chickens, being raised about 42 days.

+ *FS2*: The farming system of layer or reproduction poultry at semi-commercial with minimal to moderate bio-security level. This system keeps regularly layer hens (FS2a) or ducks and parent hens, ducks or Muscovy ducks (FS2c) at semi-commercial scale using industrial feed. Parent hens are both confined and grazed in good facilities or personal fields while layer ducks and reproduction Muscovy ducks are commonly raised in area around villages or in rice fields. The layer hens are ISA Brown, Egypt and Ross 508 bought from enterprises, center of poultry research. The layer ducks (FS2b) are super egg ducks that are imported from Triet Giang and French Muscovy ducks. Layer ducks are raised in the rice fields for taking the residual paddy. These poultry farming sub-systems moderate bio-security level by intensive production but farmers' technical and epidemic sanitary knowledge are still inadequate. Only layer or reproduction chickens are strictly vaccinated before a laying period, but not layer ducks and reproduction Muscovy ducks. In addition, there are some different flocks of reproductive birds such as hens, ducks and Muscovy ducks in the FS2c sub-system in the same farm. They are raised together within a limited area.

+ *FS3*: In the broiler production system at semi-commercial scale with low to minimal bio-security level, most of farms keep different chickens and ducks in the same household. Only white industrial chickens (FS3a) are confined and strictly vaccinated in some farms. The local chickens and broiler ducks are freely grazed in farmers' privately-owned allotments or transhumant on rice fields for taking the residual paddy. The cross-bred meat ducks or imported breeds (FS3b) are popularly raised such as broiler ducks of Bau Canh Trang, CV Super Meat and French Muscovy ducks. Most of broiler chickens and ducks are not vaccinated. The broiler production is very intensive with many flocks (cycles) per year by using industrial feed. Especially, the hen-houses of broiler transhumant ducks are very limited or inexistent.

+ *FS4*: Village/backyard poultry production system with low bio-security level. General characteristics of this farming system are low investment, free poultry ranging, and farmers' self-production of old day chicks and local breeds. Normally, the birds are not vaccinated. Farmers use different poultry breeds in the same farms. According to the Department of Livestock Production (2006), the whole country has 90% of small-farms at small scale, producing about 65% of national poultry production.

### **3.3. General characteristics of poultry production systems**

The semi-commercial poultry production in Vietnam began in early 1990s, however integration chicken production started much later, in 2000s. Thus, the farmers typically have only from 6 to 12 years experience of poultry production. The average age of household head is from 41 to 46 years old. In general, each household has two main familial actives for keeping the poultry. However, in backyard poultry production system (FS4), the head of the farm is more than 50 years old and some young farmers are about 30 years old. A small part of products is directly consumed in the family during the Tet festival or different celebrations and the other major part of poultry are sold to earn some income in cash.

System 1, the young hens and broiler chickens are kept in the industrial mode with a high bio-security level and all birds are vaccinated against different disease. According to the DLP, this poultry production system is limited and outputs are still low.



Ducks, Muscovy ducks are commonly kept in the system 2 and 3 with low to minimal bio-security levels. Broiler and layer ducks are grazed on rice fields or in gardens and fish ponds, but they are not isolated from other domestic animals. The breeding duration is short with broiler ducks such as French Muscovy, CV Super Meat ducks and Bau Canh Trang ducks. However, in the system 4, there are different types of birds in very small scale farms. This poultry production system is a low bio-security level. The day old chicks are bought in local farms or produced in the same farm. The breeding duration is long and the chicken feed comes from by-products of the farm.

In system 1, the scale of young hens is about 6,610 heads/year with a contract of two flocks a farm/year and broiler chickens are about 18,227 heads per year with a contract from 2 to 4 flocks a farm/year. In the poultry production systems at semi-commercial, the layer or reproduction birds are about 500 heads/farm/year and only 1,130 broiler chickens and 1,600 broiler ducks/farm/year. The heads of bird in the backyard poultry production is really limited with only 5 parent hens, 2 layer ducks, 60 broiler chickens and 35 broiler ducks per farm a year. So structure of bird flocks is very low and the poultry production is dispersed at small scale in each household farm.

### **3.4. The implicit risks in poultry production**

#### **3.4.1. Source of day old chicks and ducklings**

Before the epidemic disease of avian influenza at the beginning of 2004, poultry research centers, state enterprises and foreign enterprises played an important role for supplying household farms in day old chicks. Therefore, the origin and the quality of day old chicks were well controlled. Since the avian influenza in this time and government control measures against the avian influenza, poultry egg incubation is limited or forbidden, while the demand of day old chicks from breeders is really high by the lack of poultry meat on the market after each campaign against epidemic disease. Since then, the explosion of private hatching incubator made this production out of control of appropriate authorities.

In fact, day old chickens are mainly supplied from private incubation farms of poultry eggs in which color parental poultry are the same as of the commercial poultry production farmers. Particularly ducks and Muscovy ducks are mainly kept in the Phu Xuyen District, and then these day old chicks and ducklings are sold to farmers of many provinces. In the systems 2 and 3, there are 70% of household farms who bought day old chicks for laying from private hatching incubators. Only 10% of household farms in these systems bought day old chicks from enterprises or poultry research centers. The origin of day old chickens supplied from private incubatory farms occupying over 80% of household farms. Thus the technical and scientific knowledge of breeders depends on the system of private incubatory farms. Avian influenza risk is high in those private incubatory farms due to the lack of control from authorities; and the parental poultry flocks are not vaccinated against the avian influenza. In the backyard poultry production system, day old chicks are bought in the same village or are brooded at the same farm households which still occupied an important role.

Currently, the chicks and ducklings resources are largely depended on unofficial imports from China such as the breeds of Luong Phuong chicken, Bau Canh Trang duck, Triet Giang layer duck... The white chicks (industrial chickens) are principally supplied by the foreign enterprises such as CP Group of Thailand, Japfa of Indonesia and some state enterprises such as Luong My, DABACO...

The color chicks such as Luong Phuong chickens... are mainly supplied by some state enterprises and the poultry research centers but these resources are very limited. So another important resource of color chicks and ducklings are provided by the private hatching farms in Phu Xuyen District but the quality control measures in these facilities are still very limited. In addition, the local chicks are supplied from the small households in each village.



### **3.4.2. Feed source and the knowledge of producers**

There are 100% of farm households in the system 1 having 100% of the diet from a contract between the enterprises with farmers. The semi-commercial poultry production systems used industrial feed for raising birds, in which 80% to 100% of the diet for layer hens, Muscovy ducks, CV Super Meat and 50% to 100% of the diet for industrial broiler chickens and ducks in system 3. Agricultural by-products only played a central role in poultry production at small scale in system 4 because farmers in other systems mainly use industrial feed for birds. Thus, the industrial feed is crucial in poultry production. The fluctuation of feed price is disadvantage with farmers in the crisis period of food and finance in the world at present.

The technical and scientific knowledge of the breeders are still poor among the whole systems. In particular in semi-commercial and backyard systems, there are only 20% of household's head who had ever participated in a course talking about the breed expansion. The producers only improved their knowledge from their accumulated experiences and from the marketing program of veterinary enterprises. However, there are 3% of household's head in the system 4 who had ever participated in a course. These farms are sometimes not poultry producers but they play a significant role in small villages or communes.

Most of the farmers did not know the name of vaccines against avian influenza disease caused by H5N1 virus, particularly in the backyard poultry production households. Therefore, the scientific knowledge of poultry breeders is still very limited, particularly in the systems 2 and 3. The use of antibiotics is popular in poultry production in the whole farming systems for treating sickness of poultry flocks. In this research, there are from 40% to 65% of farmers in the systems 2 and 3 buy themselves medicines to treat their birds with an average duration from 3 to 5 days. If the birds couldn't be survived after this duration, the sick adult bird is mainly sold at low prices to consumers through intermediaries (equal from 25% to 50% of the normal prices). The dead chicks and ducklings are thrown out in public rivers, ponds or rice-fields.

In fact, the propaganda information by the communicate means has highly affected consumers with the poultry products within the epidemic times. Before appropriate authorities proclaim avian influenza caused by H5N1 virus, the most of farmers did not know the danger of this epidemic disease. There were from 40% to 60% of farmers who had still killed dead or sick poultry. After the Government propagandizes information on the avian influenza, 30% to 40% of farmers who had culled their birds because of not sell their birds. In the backyard poultry system, the value of poultry was not important; a part of birds had been consumed in households or sold at reduced price to the local market (42% of farmers had sold at reduced price, 52% of farmers had still consumed and only some other farmers had culled their birds). Therefore, the habit of farmers in commercial farming systems was selling their birds with low prices while an important part of birds in the backyard system were consumed.

### **3.4.3. Vaccination and the avian influenza epidemic risks**

The Vietnamese Government used the vaccination program against HPAI on poultry flock caused by H5N1 virus such as a good effective tool to deal with this epidemic disease in Vietnam. This is based on the support of political systems (Communist Party, Authorities and social organizations at various levels...) and social popular organizations for implementing effective preventive measures. This program is directly carried out from the central government to villages in each region, provinces, districts, communes and villages. Vaccines are imported and given to the provinces and then distributed to districts and communes. The surveillance program of H5N1 virus after vaccination is financed on equal part from the State budget and the provincial budget and some international organizations such as World Bank program...

There is a steering committee at each level from the Ministry of Agriculture and Rural Development to the provinces (Department of Agriculture and Rural Development), then to districts (Office of



Agriculture) and finally to the communes (People's Committee). In addition, come groups of vaccination are organized at each commune and village. Most of the birds are vaccinated directly at farm level. The preventive vaccination program is carried out obligatorily to birds according to the specific rules for each birds and poultry production scale. Among them, the enterprises and the farms with more than 2,000 birds have to vaccinate their birds by themselves. The small-holders and commercial farms are subsidized to 100% of vaccine and vaccinated expenditures. At central authority level, vaccination program are directly made a plan of anticipation of vaccine, expenses and surveillance system after each vaccination campaign by Department of Animal Health (DAH) under Ministry of Agriculture and Rural Development (MARD).

Organization of a vaccination campaign is directly implemented from Sub-Departments of Animal Health (SDAH) under Sub-Departments of Agriculture in each provinces to Stations of Animal Health in each districts, and then to Board of Veterinary Agents at each communes. The groups of vaccination are established at commune and implemented at villages or hamlets. In the North, the flocks with more than 50 birds are vaccinated at farm households and the flocks with fewer than 50 birds have to take the birds to a point of vaccination at village. In the South, all birds are vaccinated at household. The State organized two vaccination campaigns against H5N1 per year but there is an additional vaccination between campaigns since 2007 in some provinces. Since July 2007, it has been obligated to vaccinate every new bird flock in Red River and Mekong Deltas. The birds are vaccinated two doses per campaign for layer, breeders in some provinces in South but one dose in most of province in North (Table 2). The broilers, having a life cycle below 60 days are vaccinated one single dose. Each vaccination campaign is implemented from 10 - 15 days.

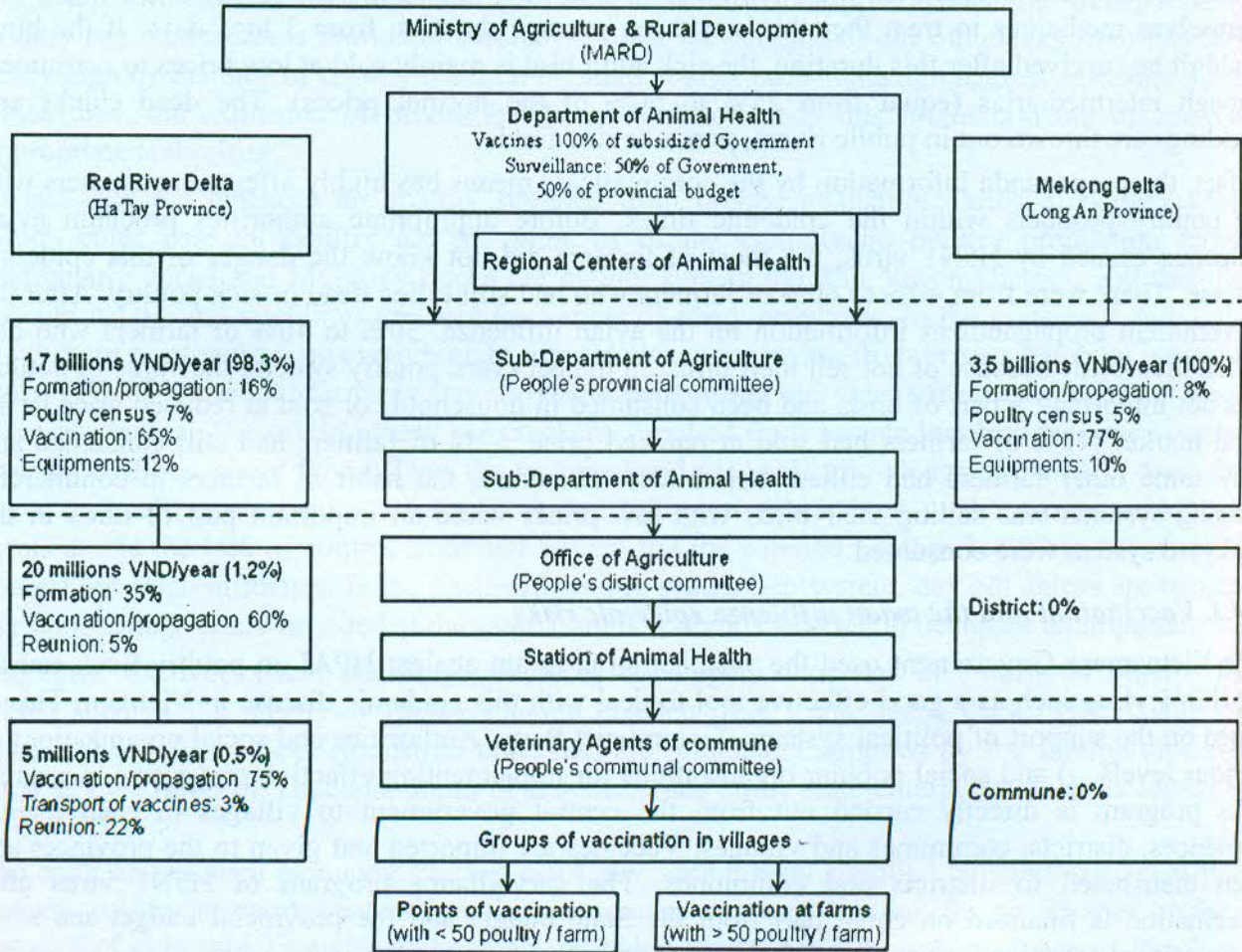


Figure 1. Repartition of the vaccination costs according to different administrative levels

Source: Result of research in Red River and Mekong Deltas, 2007



**Table 2. Differences in the vaccination program between Red River & Mekong Deltas**

| Red River Delta   | Mekong Delta  |
|---|---|
| - 1 dose per campaign and no vaccination for layers during laying period (losses in productivity) | - 2 doses per campaign (layers, breeders). 1 dose for broiler birds under 60 days old |
| - No additional vaccination campaigns before July 2007  | - Additional vaccination in between campaigns since 2006                              |
| - Since July 2007 every new flock has to be vaccinated  | - Since July 2007 every new flock has to be vaccinated                                |
| - Vaccination at the centers for farms with under 50 heads  | - Vaccination at the farm for all the farm sizes.                                     |
| - Vaccination at the farm for more 50 heads.  |   |

Source: Result of research in Red River and Mekong Deltas, 2007

The budgets of vaccination campaign depended on economic conditions in each province. There is a mandatory vaccination for the birds in some provinces of Red River and Mekong Deltas and Central Coast. The vaccine is imported by using 100% of Government's budget while the budget of vaccination is shared between the central and local budgets or between the administrative levels. There are normally two principal vaccination campaigns per year; and since July 2007 additive vaccination campaigns will be applied to new flocks.

**Table 3. The use of vaccine and avian influenza epidemic risks in poultry production (%)**

| Systems  | System 1           |                           | System 2            |                      |                               | System 3                  |                        | System 4<br>(n = 32) |
|--|--------------------|---------------------------|---------------------|----------------------|-------------------------------|---------------------------|------------------------|----------------------|
|  | Young hens (n = 5) | Broiler chickens (n = 15) | Layer hens (n = 21) | Layer ducks (n = 28) | Mixed hens and ducks (n = 24) | Broiler chickens (n = 17) | Broiler ducks (n = 18) |                      |
| Regular use  | 100                | 100                       | 57.14               | 71.43                | 95.83                         | 82.35                     | 44.44                  | 6.25                 |
| Sometimes  | 0                  | 0                         | 38.10               | 25.00                | 0                             | 11.76                     | 27.78                  | 43.75                |
| Not use  | 0                  | 0                         | 4.76                | 3.57                 | 4.17                          | 5.88                      | 27.78                  | 50.00                |
| Avian influenza epidemic risks in poultry production |                    |                           |                     |                      |                               |                           |                        |                      |
| Already epidemics                                    | 0                  | 33,33                     | 14.29               | 46.43                | 41.67                         | 35.29                     | 38.89                  | 28.12                |
| None still with epidemics                            | 100                | 66,67                     | 85.71               | 50.00                | 54.16                         | 64.71                     | 61.11                  | 68.75                |
| Not to know of cause*                                | 0                  | 0                         | 0                   | 3.57                 | 4.17                          | 0                         | 0                      | 3.13                 |

\*\* The poultry is profusely dead but don't know the cause

Many poultry herd were infected with HPAI caused by H5N1 virus in the first and second outbreaks of 2003 - 2005. After the avian influenza outbreaks in Vietnam, a large number of farms had been vaccinated for some birds' diseases such as Newcastle, Gumboro and against avian influenza. In whole systems of poultry production, only birds in the system 1 and layer or reproductive hens are vaccinated by a strict schedule. While the layer ducks and French Muscovy ducks are regularly not vaccinated, especially these birds are not vaccinated during the layer period. In addition, the broiler ducks are often not vaccinated by a schedule and the birds in the backyard system are not vaccinated (Table 3).



However, still many birds were found infected by H5N1 virus after the vaccination campaigns against avian influenza. The epidemic risks in poultry often happened from this year to another in research communes from 2005 to present. Over 60% of households have encountered a problem with epidemic disease with an important poultry death rate. In recent years, the French Muscovy ducks have often contracted an epidemic disease with up to 70% of households. So a lot of households are lost-making due to the massive epidemic, especially in the production of French Muscovy ducks and broiler ducks. Thus, the measure of mass vaccination campaigns is nowadays used as a good strategy against HPAI for the restructure of poultry production in Vietnam. But, the effect on vaccination campaign is still dependent on the policy economic conditions of each province; and there is still a need for research on the socio-economic themes to comprehensively understand the causes of next avian influenza outbreaks and farmers' incentives to vaccinate.

#### 3.4.4. Fluctuation risk of prices of inputs and outputs

The fluctuation of inputs and outputs' price greatly influences on farmer's poultry production in these communes of the research (Figures 2 and 3). Especially, the price of inputs such as animal feed, maize, soybean and paddy are strongly influenced by a fluctuation of these prices on the international market. The pinnacle of fluctuation of prices is from September to October, 2008. The concentrated for broiler chicken is 13,850 VND/kg, with 9,120 VND/kg for broiler duck and the maize is 5,000 VND/kg. At the end of 2008 and early of 2009, the price of these feed were decreased from 15% to 20%, but these prices were still higher than before 2008. However, these prices increased to 10% compared with early 2009.

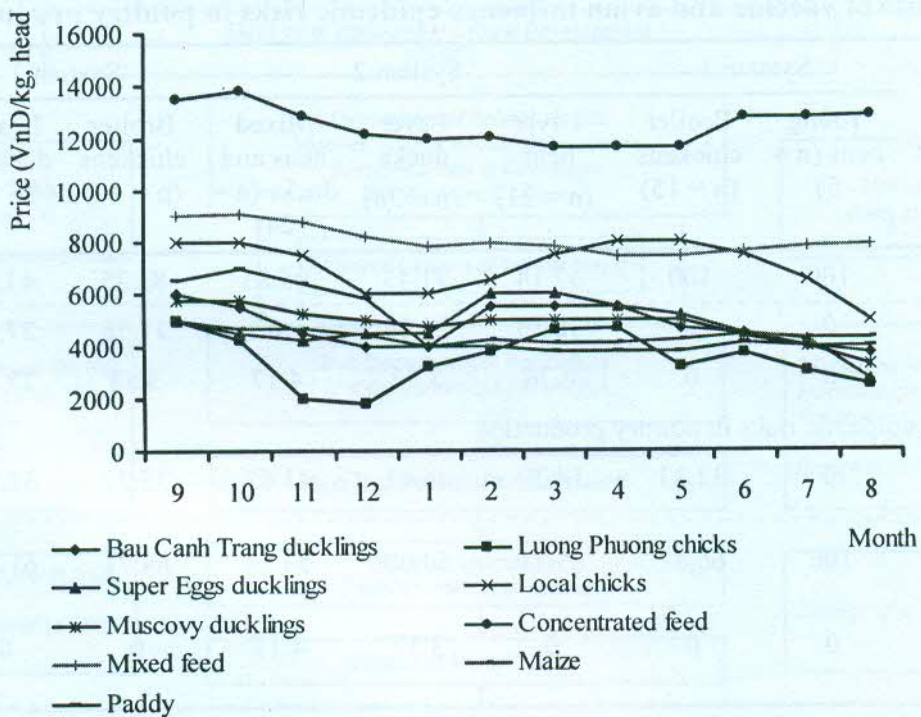


Figure 2. Fluctuation of prices of some chickenfeed and day old chicks/ducklings in poultry production from September, 2008 to August, 2009

The farmers will normally reduce their animal production scale when the price of feed increased and the price of outputs such as broiler poultry and its products began to decrease. The prices of day old chicks and ducklings continuously decreased from 2008 to 2009, or reduced from 20% to 65% for Luong Phuong chicks at Phu Xuyen District. Sometimes, the prices of these products highly increased in a short time.



However, the prices of local broiler chickens and color chickens are usually kept stable from 65,000 to 70,000 VND/kg with local chickens and from 35,000 to 40,000 VND/kg with color chickens but the price of broiler duck strongly decreased to 23,000 VND/kg in August, 2009, reducing to 25% compared to early 2008. So the fluctuation risk of prices of inputs and outputs strongly influenced poultry production; and these previous observations seem to be the main factors of an unsustainable poultry production in this province.

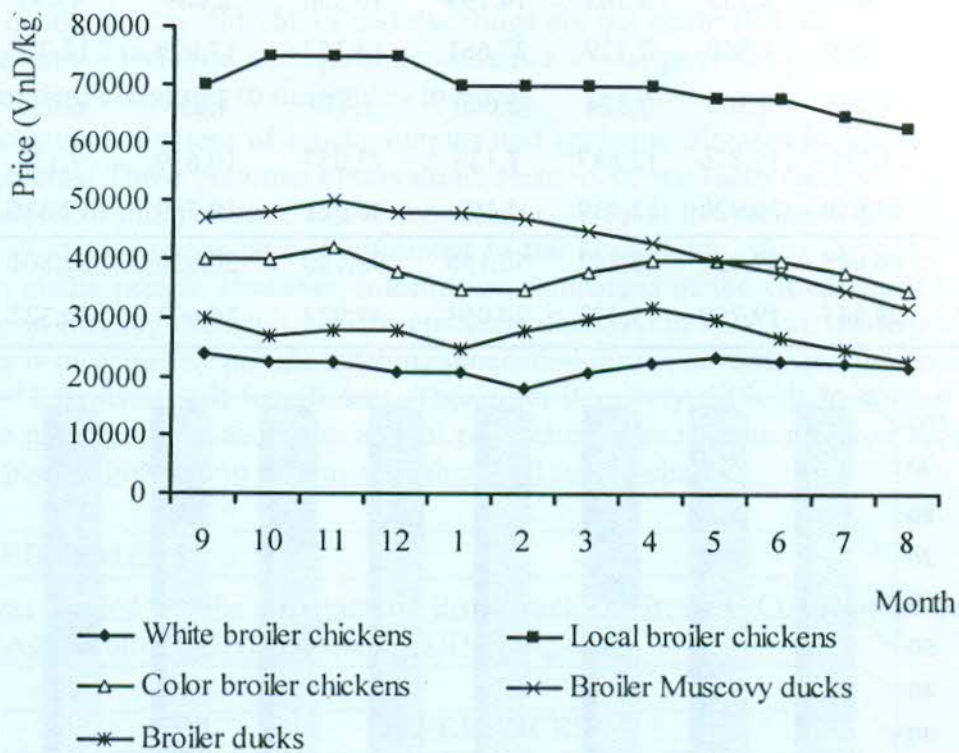


Figure 3. Fluctuation of prices of some broiler poultry in poultry production from September, 2008 to August, 2009

### 3.5. Economic efficiency in poultry production

Over 86% of birds of systems 1, 2 and 3 are sold to Ha Vy market of Thuong Tin District or some small special poultry markets around Hanoi City through intermediaries in this region. The number of bird reserves for farmer's self-consumption demands in system 4 occupies to 40%. However, the transport and slaughter of living poultry is relatively very small. It is difficult to control the epidemic disease and the quality of poultry products.

Economic results in these systems are very unsettled. The color reproductive hen production has a good economic efficiency with about 164,000 VND/hen/cycle but many layer ducks, reproductive Muscovy ducks and broiler ducks farms are loss-making due to epidemic disease and the great fluctuations of prices of input and output in poultry production. Many farms lost up to 65.8 million dong/year in reproductive ducks CV Super M. Broiler poultry production at semi-commercial scale has a lower economic efficiency, with average is from 10 to 17 million dong/farm/year.

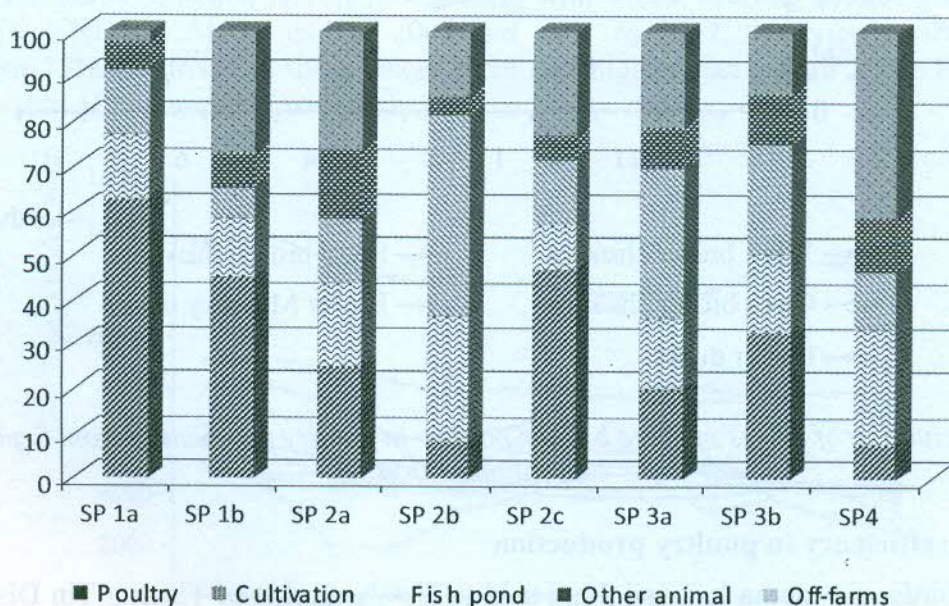
The net income of poultry production in systems 1, 2 and 3, occupied from 30% to 60% of total income of household. While the net income from layer ducks in system 2, and backyard production system is less than from 3.5 to 4.2 million dong/farm/year, occupied about 8% of net income in a household (Table 4 and Figure 4).



**Table 4. General economic results of agricultural production of the farms per a year**

(Unit: 1,000 Vietnam dong)

|              | FS 1            |               | FS 2          |               |               | FS 3            |               | FS 4          |
|--------------|-----------------|---------------|---------------|---------------|---------------|-----------------|---------------|---------------|
|              | Broiler chicken | Young hens    | Layer hens    | Layer ducks   | Mixed         | Broiler chicken | Broiler ducks |               |
| Cultivation  | 9,435           | 7,735         | 8,763         | 14,198        | 10,356        | 8,069           | 9,493         | 11,605        |
| Fish pond    | 10,000          | 4,000         | 7,229         | 22,661        | 14,167        | 17,000          | 12,778        | 5,469         |
| Other animal | 4,267           | 4,300         | 7,524         | 2,000         | 5,479         | 4,853           | 6,056         | 5,648         |
| Off-farms    | 1,333           | 15,876        | 12,887        | 7,136         | 23,057        | 10,659          | 7,139         | 18,398        |
| Poultry      | 41,610          | 25,920        | 12,439        | 4,162         | 46,721        | 10,369          | 17,336        | 3,471         |
| <b>Total</b> | <b>66,645</b>   | <b>57,831</b> | <b>48,842</b> | <b>50,156</b> | <b>99,780</b> | <b>50,950</b>   | <b>52,801</b> | <b>44,590</b> |
| VAN/active   | 29,345          | 19,760        | 15,973        | 24,054        | 47,922        | 26,603          | 24,323        | 20,105        |



*Figure 4 Structure of net income according to poultry production systems*

Therefore, poultry production in the studied region is facing serious difficulties. In order to sustain the production development in the next years, it is necessary to apply the good scientific knowledge or good practical poultry production systems such as HACCP to farmers. In addition, the Government needs to provide the useful information on the poultry production region and international markets and it is necessary to encourage establishment of a network of poultry production and poultry products supply chains with good quality and good traceability.

#### 4. CONCLUSION

There are four major poultry production systems practiced in Hanoi Suburban area (1) Chicken integration production by a contract between farmers and chicken production enterprises with high bio-security level, (2) Layer or reproduction poultry at semi-commercial with low to moderate bio-security level, (3) Broiler poultry production at semi-commercial scale with low bio-security level, and (4) Backyard poultry production system with low bio-security level.



The measure of mass vaccination campaigns is now used as a good tool against HPAI for the restructure of poultry production in Vietnam but, the effect on vaccination campaign is still dependent on the policy economic conditions of each province. There is still a need for research on the socio-economic themes to comprehensively understand the causes of next avian influenza outbreaks and farmers' incentives to vaccinate.

Economic results in these systems are very unsettled, the color reproductive hen production has a good economic efficiency; nevertheless layer ducks, Muscovy ducks and broiler ducks are loss-making. The quality of day old chicks and ducklings are not controlled. In addition, the raising is very intensive but the technical and epidemic sanitary knowledge of the breeders are still limited. It is a cause of epidemic diseases to the poultry breeding.

The large fluctuation of prices of inputs, outputs and epidemic diseases in poultry production are important problems. These previous observations seem to be the main factors of an unsustainable poultry production in this province and in the whole country at the moment. The birds are usually bargained away at low prices or self-consumed in the households when the epidemic disease is announced on media means. However, information campaigns of the Government have played an important role in limiting the spread of the epidemic diseases. In addition, the major proportion of day old chicks is provided by private hatching incubation farms; nevertheless the control process of these household farms is still insufficient. Therefore, it is very difficult to control the epidemic disease on the poultry flocks and other animal production. The risks in the food supply chains are very grave in poultry production system and other food supply chains.

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