ANIMAL DISEASES SURVEILLANCE AT THE LOCAL SCALE IN THAILAND:
STUDY OF SOCIAL FACTORS LINKED TO A VILLAGE COMMUNITY CHOICES

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Abstract

The rapid emergence of infectious diseases in high risk areas ("hot spots") such as Southeast Asia makes it essential to understand the functioning of animal disease surveillance systems at the local level. This requires detailed study of the social determinants of choices made by individuals and communities choices with respect to animal health. An exploratory study of the combined use of various tools from anthropology, participatory epidemiology and modeling was made on a village community in Thailand. Interviews with farmers and other actors engaged with animal health issues permitted identification of the social networks which make up community-level thinking. These networks distribute sanitary information and partially overlap with the official surveillance network. Three networks have been identified: ducks farmers, fighting cocks breeders and animal production industrial firms. From the data gathered on the history of the village, it’s socio-political organization, and local practices of disease management, it was possible to identify social factors that could explain the discrepancies between the local actors behavior observed on the field and the official surveillance system, using the detection of a case of highly-pathogenic avian influenza in poultry as an example. Quantifying these factors and the social costs associated to a decision to declare or not to declare a case is required. A model of the entire local system would allow the principal dynamics to be visualized. This could lead to recommendations for improved animal disease surveillance in Southeast Asia.

Key words: Surveillance; Network; Community; Social factors; Avian influenza; Thailand.

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Abbreviations list

CIRAD Centre International de Recherche Agronomique pour le développement
CP Chareon Pokphand
DLD Department of Livestock Development
PENAPH Participatory Epidemiology Network for Animal and Public Health
REVASIA Recherche pour l’Evaluation des systèmes de surveillance en Asie du Sud-est de l’Influenza Aviaire
SNA Social Network Analysis
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Against emerging diseases, for the majority of animal origin (Jones et al., 2008), and the threat of pandemics, epidemiological surveillance appears as an essential tool for managing international health (Dufour and Hendrickx, 2011). Establishing efficient and sustainable networks has become a major public health issue.

Evaluation methods of surveillance in animal health are diverse. They take into account biological factors and performance, but often ignore human aspects related to the participation of stakeholders to surveillance and modalities of circulation of information on animal health as well (Antoine-Moussiaux, 2011). The conventional approaches to surveillance systems are applied to pyramidal networks, which are limited to case reports according to formal channels and apply through a centralized administrative hierarchy. It seems relevant to develop new methods of information gathering which would be based on more complex networks in which information is transmitted through informal channels and rely on lay knowledge (and Figuié Desvaux, 2011). Indeed, recent work on avian influenza in Vietnam shows that there are informal networks of health information, differing from the rules established by the government (Desvaux, 2011).

Moreover, acceptability is part of a qualified surveillance system, as defined by the Center for Disease Control (Buehler et al., 2004). It is therefore important to identify the factors that influence acceptability. The social costs of surveillance should then be sought to better assess farmers involvement. Since it is difficult to quantify these factors by an external evaluation, approaches that rely on the participation of farmers show relevance. In order to identify these social and economic factors implied in the surveillance process, it is important to first understand how work animal disease surveillance networks at the local level. This involves looking at how to put farmers in the wider system of management of animal health and what dynamics are at work in the local community system.

The objective of this study is to understand the socio-political, economic and religious functioning of a village community in the central plain of Thailand and how this community involves in surveillance systems for animal diseases. The research team developed the following hypothesis: there are social and economic determinants that explain the difficulties of implementing official surveillance systems on the ground. Power games and social pressures on local actors of surveillance processes are here targeted.

Within the general framework of the research project (described later), there is a focus on avian diseases monitoring (with the aim of detection of highly pathogenic influenza), without neglecting the other domestic species of the village to understand the local dynamics toward animal health general management.
During the avian influenza crisis of 2004-2007, hundreds of millions of domestic poultry have died due to infection or have been culled to contain the spread of the disease. Thus, this crisis has deeply affected village communities, on the one hand by the losses caused by the disease in poultry, and secondly by the involvement of villagers in the surveillance and control of the virus.

With the many adaptations of his surveillance system, Thailand has made an important effort to early detect the virus and to implement reactive, efficient and quick control measures (Safman, 2009). However, Southeast Asia is still often perceived as the birthplace of the influenza virus. Thailand is a possible starting point for new outbreaks. Indeed, even if the number of outbreaks in poultry has decreased significantly since 2005, the presence of cases in two provinces in late 2008 indicates that the threat of highly pathogenic avian influenza is still present in the country (Paul et al., 2009).

Rapid societal changes and development priorities complicate the management of human and animal health, erected today as a global public good (Antoine-Moussiaux, 2011). Facing pandemic risk on a global scale, dependence toward the less effective operator in surveillance or rapid eradication of an invasion is an additional call to a suitable methodological renewal, in the context of emerging and developing countries (Rich and Perry, 2010).

Health surveillance must take place in a particularly constrained by financial and human resources as well as the isolation of rural areas. In addition, the great diversity of animal production methods, the large size of the family farm in national herds and the political priority given to the reduction of poverty reinforce the issue of inclusion of social aspects in making decision public health management. More specifically, the detailed understanding of the determinants of choice of individuals and local communities on animal health is necessary to understand both the benefits and costs of a management program. Also, understanding the factors necessary for local ownership is crucial for the effectiveness and sustainability of the system nationally and internationally. The challenges of increasing emergence of pathogens in high-risk areas such as Southeast Asia, make essential multidisciplinary research.

The study is part of the project REVASIA, implemented in 2009 by CIRAD, which offers multidisciplinary research to support the evaluation of surveillance in Southeast Asia. Tools borrowed from anthropology, sociology and economics can bring new elements, in addition to purely epidemiological data, to understand contagious diseases surveillance. Participatory approaches with communities also enrich the collection of field data. The combined use of these new tools offers the possibility to identify the socio-economic factors suspected to play a major role in the effectiveness of disease surveillance, in view of extending such studies at other countries in Southeast Asia. For this study, expertise from anthropology, sociology, epidemiology and modeling were brought together.
2.1 Study area selection

Sukhothai province was chosen because it has integrated farming systems for a wide variety of species and practices. Five villages were visited thanks to contacts from the veterinary services. The village selected by the team is called Baan Nhoong Ngeun. It is located in the district (Amphoe) Kon Krailat, south-east of the province of Sukhothai (Figure 1), which is No. 7 of the eight villages of the sub-district (tambon) Ban Mai, adjacent to the province of Phitsanulok. The village 7 is located along a main road in the network "Asian Highway" which crosses the country from east to west. The local scale of the village has been chosen in order to have a fairly idea of community issues. However, interactions between villagers and key individuals or organizations outside the village were also studied in order to replace the village activities in the general context.

2.2 Check lists
The check list summarizes the key points and exercises to cover during a study session or interview. This allows the interrogator to remain flexible and to the respondents to spontaneously express their thoughts in their own conceptual frameworks (Moscovici and Buschini, 2003). The check list provides a general orientation and ensures that no major point is forgotten during the interview, while providing potentially useful tools for each item on the list. All elements of a check list do not need to be covered in each interview, as long as they have been treated at the end of each stage. Tools from the participatory epidemiology integrated during the open interviews are in Appendix 2.

2.3 Fieldwork

After the establishment of a flexible protocol, seven weeks of fieldwork was conducted through a team of two research assistants: Sophie Valeix the (University of Montpellier, France) and Attawit Kovitvadhi (University of Kasetsart, Bangkok, Thailand), respectively as interviewer and translator/organizer. A local contact has ensured the smooth conduct of the study: Doctor Veterinarian Supoj Noopataya, Head of Animal Health department of Sukhothai province (Department of Livestock Development, DLD). This collaboration first allowed a better understanding of the region with the selection of a village and greatly facilitated relations with local stakeholders throughout the duration of the study. Part fieldwork was carried out in three stages during which 57 interviews and ten informal observations were conducted. These steps were separated by times for analysis and preparation of the next stage, in Bangkok. The interviews were scheduled, as much as possible, to confer a comfortable environment and during free moments of the day.

2.3.1 FIRST STEP : STUDY OF THE LOCAL CONTEXT

During the first stage, 41 interviews were conducted over a period of four weeks. The objective was to understand the social, political and religious life in the village. It was also discussed approaching the functioning of the agricultural production, the constraints associated with them and the ways the villagers used to meet these constraints. This was discussed with a particular focus on animal diseases in order to identify key players in the control of animal diseases and prepare the second stage.

2.3.1.1 EXPLORATORY PHASE

The purpose of the exploratory phase was to make contact with the local population, present the study to the politicians and social leaders and understand the socio-political context (days 1-3) through a series of interviews and meetings. In addition, the invitation to participate in religious or cultural events (funerals, concerts of traditional music) helped set up our presence in the village with respect of traditions. Individual interviews (days 4-18) were then focused on agricultural production systems in the village. In order to visualize the variability between farmers but to identify common types, three pig farmers, three cow farmers and three duck farmers were selected. Points 1-7 of the interview guide No. 1 were discussed in priority.

2.3.1.2 FOCUS GROUPS

Targeted interviews were subsequently conducted (days 19 to 23) with groups of swine, cows and ducks. It was further discuss terms of farming practices but also to know more about the management of animal diseases throughout the village. Points No. 8-13 of the interview guide No. 1 were discussed in priority.

2.3.1.3 KEY INFORMANTS
The survey of key informants (see Appendix 1), that is to say people who have been identified as the source of information relevant to our study took place along the three stages. Indeed, if politicians and employees of veterinary services were targeted during the drafting of the protocol, it is very regularly that new persons to be interviewed were included in the study because of their knowledge of local socioeconomic and political dynamics.

### 2.3.2 SECOND STEP: SOCIAL NETWORK OF DUCKS FARMERS

Eight interviews of duck farmers in the tambon were conducted during this phase of 10 days. For each interview, we collected a certain amount of information in a systematic way to feed a database in order to build a social network analysis of the study area. These data were obtained in a more direct way (prepared questions), but while trying to integrate participatory approach (using tools such as proportional piling tree, photo in Annex 7) to the extent possible. The choice of duck farmers is justified by a test for the analysis of social networks on a small population affected by a health risk of emergence (Gilbert et al., 2007), given our constraints in terms of agenda. In addition, the ducks are an important production of the village. Three visualizations of social networks circulation of health information have been created from the same database obtained from interviews with the seven duck farmers in the village (software used: MSQL).

### 2.3.3 THIRD STEP: ASSESSMENT OF THE SURVEILLANCE COST

To evaluate the cost of surveillance for local actors such as farmers, we conducted 8 interviews in focus groups (group of breeders of ducks, fighting cocks, pigs and cows) over two weeks. The issues discussed in a semi-structured way were the motivations of the farmers to declare a disease to the veterinary services as well as disadvantages to do so. The objective was to study how the decision to declare or not is made. We also investigated the benefits and disadvantages that could remove local actors toward the declaration by a farmer. Finally, it was to imagine different scenarios and apply them in role-playing to reach a deeper understanding of farmers’ reactions and weigh their decision criteria. The “scoring” method with the results of the proportional piling (Ameri et al., 2009) was used in order to compare the mentioned criteria.

### 2.4 Data analysis and storage

The data were organized and summarized at the end of each interview by rewriting the raw notes on sheets which also contain information about the context of the interview and its subsequent analysis. The sheets were then proofread and corrected or improved by the interviewer and the translator. Data analysis was done by overlapping testimonies gathered during interviews and topics corresponding to items in the check lists for each step, adopting the triangulation method (Catley et al., 2011). In participatory epidemiology, the analysis is an ongoing process that takes place during and after the interview. There is a permanent cross-checking of the data updated and tools chosen always remain open to new tracks.
PARTIE 3: RESULTS

3.1 Agriculture, husbandry and livelihoods

3.1.1 LOCAL ECONOMIC STRATEGIES

The village has 83 households and 300 inhabitants, with 49% of women and 51% men. The average income of the villagers is about 100,000 baht, which is less than the Thai average. Many people, especially women, engage in an activity complementary to the main income. It is mainly making sheets, brush or other objects which can then be sold on the market or redistributed via the government. Traders / collectors play an important role in the economy. They enable trade and movement of all animal species. They represent the interface between farmers and slaughterhouses and distribution sites (which are most of the time markets). Unevenly distributed within their territory, traders represent a complex network, going from farm to farm. The animals are usually transported from one province to another, that is to say over large distances. Note also that the animals are often brought by merchants for a stay of a few days, where several species can be mixed. There are different mechanisms to assist local families in need. Sometimes Puyai write to the government asking for a financial contribution or she announces over the loudspeaker the situation for people who want to bring around their support. Finally, the family can borrow from the common fund of the village. In Ban Mai, leaders use to help their people by personal contributions as well as public actions. Economic policy is based on a pattern of solidarity and cooperation rather than competition. Some examples attest, such as shareholding a grocery store or microcredit schemes. In the village, microcredit is proposed through common fish pond and mushroom breeding, and what has been called "mini-bank". The "mini-bank" (kong moo-ban-toon) is an emergency loan, offering villagers to acquire up to 200,000 baht per month in case of need and at a very low fee by paying 30 baht / month. But, in one way or another, intervention or supervision from officials is required. This pattern of cooperation and solidarity rests on the authority of some uncontested dominant social actors in the system.

3.1.2 IMPORTANCE OF AGRICULTURE

According to officials, less than ten households would not practice farming in village 7. Villagers work in the rice fields on their own land and or rent fields belonging to others. Rice is the primary source of income in the village and is the practice that employs the most people. Nowadays, many households have harvest machines. Moreover, the village good irrigation system allows rice growth throughout the year. Farmers realize thus two crops per year instead of one in the past. Every inhabitant of Ban Mai usually has several rice lands. A very few fields are sold today. Since 2001, the price of rice is guaranteed by the government and remains stable. Such subsidies allow farmers a stable income, putting away losses as well as gains. Due to the rural exodus of young people, the average age of farmers in rice fields is high. It thus happens that households rent their fields, rarely selling their land. Families with small rice lands surface often practice husbandry.

3.1.3 HUSBANDRY: A LIFE CHOICE

Four species can provide a primary or secondary income (after rice): cows, ducks, pigs and fish. Breeders usually choose to have one or the other of these species. While raising backyard chickens (5-15 chickens) and small fish pond is a common practice, it is not in itself a sufficient source of income. When compared
with other villages in the tambon, the village 7 has the biggest livestock population, with a specialization to duck hens. Village 7 has three cowherds, four hog feeder (including a contract with the industrial food big firm Chareon Pokphand, CP), seven duck farmers and an industrial fish breeder. Cows and buffaloes were the first farm animals used for traction in the rice fields. Chickens and fighting cocks are also high longstanding tradition in this country. Then, animals such as pigs and ducks have appeared more recently. We are today witnessing an intensification of livestock farms with large farms integrated with industrial firms such as CP. Breeding cows is described by farmers as a very risky activity but potentially profitable, subject to fluctuations of the price of meat in the domestic market. Swine breeding is an additional source of income and a mean of diversification for small farms. But the importance of pigs for farmers under contract with the CP group is much bigger. The integrated farming with CP is a simple way to get a regular and continuous income without much effort. However, it requires an initial investment (barn) based on farmer's ability to borrow money from banks or other creditors over a decade (including pledging his land). Free range ducks are also a good source of daily income. It requires no significant investment and involves little work (ducks spend their time in paddy fields where they feed). Outside sales, a very small quantity of eggs are kept for domestic consumption and another is given to the rice field owner who hosts the animals. Ducks are beneficial to rice culture because they fertilize lands, eat pests (mussels) and allow a synchronized growth of the plant for efficient harvesting. Because based on bets, breeding and training fighting cocks does not provide a steady and important income. However, this activity, exclusively for men, occupies an important place in social life. Players are grouped by teams to give themselves the best chance of winning in official fights and participate almost daily to local fights organized in villages.

3.2 Official surveillance system

![Diagram of official surveillance system]
Avian influenza is a disease that involves the most important surveillance system, which has been allocated the first budget by the DLD of Sukhothai province (see Figure 2). “Passive” or general surveillance component is based on the voluntary reporting of any clinical suspicion of infection by a virus of type A/H5N1 (highly pathogenic) by owners of chickens and ducks to members of DLD (Goutard et al., 2012). These suspicions are based on the case definition established by the DLD. Since July 2005, the mortality rate threshold for the clinical case definition is 1% for commercial farms, and 5% for backyard poultry in two days (Pasavorakul, 2010). In addition to the routine screening system, which focuses on commercial farms (at the poultry sale), the Thai government has put in place (end of September 2004), an intensive and active surveillance campaign called “X-ray” survey. This component, still in place today, specifically targets free grazing ducks and backyard chickens. X-ray campaigns are conducted in both human and animal populations throughout the territory (Paul, 2011).

In the province of Sukhothai, these campaigns are held four times a year and are mainly based on the animal health volunteer. The other component of the active surveillance is the "knock-door" transects in the villages, conducted two weeks a year with the participation of members of DLD, village leaders and public health volunteers. During these two last surveys, suspect dead birds and samples (swabs, blood) are taken. During tours of the mobile unit DLD province in villages (once a month, for pets’ sterilization and vaccination), free consultations of suspect animals are proposed.

3.3 Farmers constraints and sanitary events

3.4.2 PERCEPTION OF AVIAN AFFECTIONS

Floods impact livestock as well as disturbing livelihoods. Indeed, in times of flood, animals move into the interior of houses, roads to other villages or sheltered waters. Breeders have difficulty finding hay and spend more time looking for corners grass to graze their cows. Some accidents occur when animals slip and fall into the river.

Concerning affections and diseases, farmers with backyard chickens witness oculo-nasal symptoms or rarely sudden deaths. They show, however, poor concern toward their poultry health because they only face little losses and occasionally. Breeders refer mainly ocular and respiratory symptoms at the time of the change of season (October-November). When we further investigated in stage 2, ducks farmers mentioned disease names (see Table 1). But issues not induced by pathogens are more problematic. We can note the importance of intoxications as well as dog bites, heat and stress of transportation that provoke the death of ducks under confinement. Pesticides are the major concern of farmers about the health of their animals. This is not surprising since it is the leading cause of death in ducks and that these poisonings occur on average twice a month. By using social network analysis on the sharing of information about sanitary events in ducks, we showed that death by ingestion of pesticides is the most communicated affection. Duck farmers usually consult the owner of the field who used chemicals before the introduction of the animals. Unfortunately, it often happens that the pesticides spread from one field to another through the irrigation flow. In other cases, the pesticides remain present in the fields that lead also to accidents. Dog bites occur mainly at night when the dogs roam near the enclosure rods.

Avian influenza does not appear in diseases that have affected ducks in recent years (since 2007). None of the interrogated farmers (duck or chicken) declared their farm for having been infected with the disease during the outbreak of 2004-2005. Yet, politicians and members of DLD province and district say that flocks
were touched. They evoke high mortality that affected the village during the crisis with 10 to 100 dead chickens per day with a spread to the whole tambon in one month time. Farmers affirm themselves as still familiar with the disease, its dimension and zoonotic clinical signs. Villagers use to believe that bird flu is brought by the way of wind and air and it inevitably leads to death for infected humans as well as animals even treated. Only its spread can be slowed down. Local health services agree that villagers fear a return of the disease in Thailand. When occurs the brutal change from the rainy season to winter, climate is described as cold and wet, which lead to epidemics in poultry every year. Cholera, herpesvirus, infectious coryza and influenza are all diseases that cause respiratory symptoms.

### 3.4 Surveillance local practices

Information about health events takes different routes. Group interviews in the early stages of the study allowed us to identify key actors, included in a network called “informal” because away from the rule established by the DLD, such as the village chief (Puyai) or pharmacists. This is explained by the fact that health information circulates very quickly by word of mouth in a village population in constant interaction. As soon as particular behaviors (like the sale of dead poultry and isolation of farm animals) are observed, the information goes around the village. Farmers feel not very closed to veterinary services, which reinforces their need to access “unofficial” ways of information.

### 3.5.2 FREE GRAZING DUCKS NETWORK
In Figure 3, we see that the health information flows mainly between farmers and “commercial” actors (food seller, poultry transporter, trader / collector) than to significant. The supply of smallholder raw material (food, young animals) is made by small producers and local merchants. Despite duck farmers say they would report directly to DLD if they witnessed a suspected case of influenza, DLD members constitute quite weak links in this network, which means they are not often contacted.

We then established a more precise network with individuals previously gathered into categories in Figure 6. SNA software provided an interesting measure, the "betweenness centrality" to view the most influential persons in the network, that is to say, one in which the major part of the links go, which is indispensable to get from one point to another. In our case, the individual having the value of the highest centrality is a farmer. He appears as the central element of the flow of information on ducks health in village 7. This is explained by the fact that it is one of the oldest to raise ducks in the village and technical knowledge are recognized by other breeders.

3.4.3 FIGHTING COCKS

Hence a social prestige, fighting cocks also represent a high potential economic value by winning fights. Thus, farmers reported having their best fighters to flee after the announcement of culling campaigns around suspicious farms in 2005. Despite the fact that Puyai and Kamnan both disapprove this behavior against sanitary prophylaxy, cock farmers seem to be supported by the community. However, farmers say they wouldn’t take any risk of transmitting the disease to other villages. Their reputation and social capital is at stake. Cock and chicken farmers say they would contact the village chief or the public health volunteer at first rather than the DLD to declare a suspect case. Thus, the decision to report a case of contagious disease in cocks’ farms is mainly based on the officials’ decision (Puyai, Kamnan) rather than farmers, who only comply with the rules of a local socio-political system.

3.5.4 INDUSTRIAL FIRMS’ NETWORK

Unlike small livestock farmers, only the veterinarian or technician from CP company is contacted and all is based on him managing the problem. Farmers are more performers than decision makers regarding
sanitary issues. Afraid of potentially negative impact on consumer demand, the company manages epizootics internally limiting the communication with DLD. In addition, in order to reduce the diseases transmission from farm to farm, farmers are subjected to draconian rules of access to farms, isolating them of their social environment.

3.5.5 CRITERIA OF A CASE DECLARATION

In case of reasonable mortality, farmers do everything to solve their problems themselves and the veterinarian is never called in first intention. However, when farmers feel they won’t be able to control the disease and all their animals are going to die, they ask for help. This situation depends on mortality (40% in two days on average, according to interviews of farmers in step 3), the dynamics of the disease (low but constant mortality as well as a high mortality in one day), the situation in the region (free from the disease or not) and rarely symptoms. According to all villagers, reporting a suspected case of bird flu is adopting the good behavior: it is the norm. "A farmer who knows there is a risk that his livestock is suffering from avian influenza must declare to the authorities, and if he does not, someone has to do it instead of him."

Let us consider a hypothetical situation in which a serious disease is flowing among poultry. What criteria will push people to declare or not? The histogram in Figure 4 shows that five of the eight criteria are based on the well-being of the community, or the other villagers’ opinion through a social pressure. Protecting others as well as their animals appears in second and third position which shows once again the importance of community. Compensation still appears the most important criterion for reporting, especially for fighting cocks. But the amounts, determined per kilogram of meat, are poor and delivered quite late to farmers. In fact, the real economic loss considered by farmers is represented by egg production as well as the price of a potential cock winner. Yet, farmers would declare even without any financial benefit. Except for large farms, the social norm goes to reporting suspected cases to the authorities. However, the reporting threshold of 40% is well above the rules set by the DLD, so it won’t reach the expected sensitivity of cases detection.
3.5 Social factors explaining the gap between rules and local practices

3.6.1 VILLAGE HISTORY

In 1980, one year after its creation, the tambon Ban Mai was divided into eight villages. Village 7 was born from the separation of village 1 into two parts. Among the 8 villages of the tambon, families residing in villages 1 and 7 differ from others because they have been living for a very long time in the area and thus claim to be descendants of the first inhabitants of the Kingdom of Thailand, the Kingdom of Sukhothai. While the villagers from villages 2, 3, 4, 5, 6 and 8 were installed later in the region and come from other provinces than Sukhothai. Families from villages 1 and 7 are therefore the oldest rightful owners of this area. Land rights were then allocated to new people based on overall social relations determined by the ownership of the best land. This has created a balance of power and a social debt between newcomers and residents of villages 1 and 7, assignees legitimate land area. Cohesion between members of villages 1 and 7 has been reinforced over time by the creation of a common space of rice culture through the legacies within a limited number of family groups. Their common past explains the close relationship between villagers from villages 1 and 7. In addition to the bonds of friendship and family, they share cultural activities. The gap between them and the people from other villages still exists today.

3.7.2 WEIGHT OF ANCIENT FAMILIES

We learned from the history of the village that only one family per village owned most of the land and was endowed progressively with a consistent wealth. Moreover, in all but one case, political leaders are part of these dominant families. These powerful lines mastered so for generations the political and economic power in the tambon. Kamnan has the largest share of land in Ban Mai and her family is said to have the largest fortune in the entire province. Perceived by the local population as exceptional, Kamnan and Puyai’s mission is considered as very difficult and requires physical resilience and a high sense of organization. But the essential criterion for an official is more to be rich. A good leader must financially support the villagers in trouble and public life in general to be appreciated by its population. Kamnan is said very close to Ban Mai inhabitants, by attending all cultural and social public events in the tambon. In the second election, she was the only one to apply to the position, which shows its political hegemony. She freely gives money or rice annually to the poorest households, provides employment in the processing rice factory that her husband owns and recently fully funded the construction of a new temple. She also provided air conditioning to the health center and use to provide hay to farmers in case of flooding. The community is therefore based on a traditional pattern where people who settled in the tambon have a social debt (non-financial) to the first landowners of the area as suggested by the paradigm of the “don/contre don” from Marcel Mauss (1923 - 1924) and the “social capital” of Bourdieu (1980). Creditors debt are still the most rich and influential families as they lead all the production strategies throughout the village.

3.7.4 SMALL SCALE FARMERS AS DISEASE MANAGERS

Farmers’ first reaction when encountering a health problem is to treat their animals themselves. The pharmacist advises farmers in the use of drugs according to the pathology observed. Not all species are considered as worth treating. For example, backyard chickens are never treated with antibiotics, unlike...
fighting cocks because their economic and social value is much more important. The traditional doctor (village 1) treats mainly humans. But farmers (mainly cow breeders) still call him sometimes to treat injuries such as fractures. Farmers appreciate its availability, quick reaction and its effectiveness in the treatment of orthopedic affections. Contrary to the traditional doctor, the district veterinarian is only called in the last resort. Many transactions are carried out just before the change of season (rainy season / winter) to avoid significant losses that often occur at this time or farmers practice antibio-prevention. Interestingly, affected animals are often isolated from healthy animals (with baskets). Diseased cattle or carcasses are sold to merchants but for a lower price than healthy cows. While poultry farmers say get rid of the bodies by burying them or throwing them into fish ponds if they cannot give them for food to their neighbors or friends. Generally, the information about animal health spread quickly and easily through the members of the village community, essentially by word of mouth and help is then easy to get.

DLD veterinarians believe that villagers have totally lost trust in them because they have been traumatized by the avian flu crisis of 2004-2005 due to draconian control measures at that time (potentially infected poultry being thrown alive into pits). Veterinarians in charge at the time said they were as shocked as the villagers but had no choice if they wanted to stop the spread of the disease. They think they have lost credibility from farmers. In addition, regret that farmers sometimes do not consider husbandry as their priority (but rice culture). Yet, "these small farms are the one which usually maintain the persistence of the pathogen in the district".

3.7.6 CONSEQUENCES OF A DECLARATION FOR THE VILLAGE COMMUNITY

As written above, mass slaughter of poultry in 2004-2005 caused a trauma in the population mind. This seems to have affected confidence toward the veterinary services. Besides, a declaration to the authorities implies that some herds would be slaughtered when they may not be affected by the disease. There would then be unnecessary losses for farmers and a radical change of lifestyle. Indeed, after the waves of epidemics that struck the district in 2004-2005, poultry breeding in the village has been banned, resulting in the need for many families to seek other sources of income in urban areas. According to the experts in charge of crisis management in Thailand, "social interactions were reduced as well as the time allocated to cultural life". There is thus a non-economic cost to society of control measures and thus indirectly of surveillance.
Method

The purpose of the study was to test different tools to analyze the operation of surveillance systems at the small scale. The village scale, primarily chosen, has been questioned after the first stage of fieldwork. Indeed, we quickly updated the importance of community cohesion in the understanding of the dynamics at work in the management of animal health, which is more likely to take shape at the tambon (sub-district) scale. In addition, it was found that the variability of how surveillance operates varies from a village to another. A detailed study of the tambon with highlighting the differences between villages is an interesting perspective, especially when we know that there are strong differences due to political and social past of residents. One is entitled to ask whether these differences can lead to opposite behavior when event that requires a common governance (such as during an outbreak) occurs.

The anthropological approach adopted has identified pathways for understanding social dynamics related to surveillance. But it has also created a climate of mutual openness, favorable between the research team and the local population, maximizing the results from the interviews. The use of participatory techniques has contributed as well to the production of relevant data in the sense that the actors expressed their concerns and strategies in the management of the affections of their own animals. Tools of participatory epidemiology have lead to many qualitative data but also quantitative data which can be analyzed and reveal interesting facts. However, we must be very careful in interpreting these data since there was little standardization (reproducibility) from an interview to another, which made the cross checking difficult and which could have introduced some biases, implicit to an exploratory study.

The use of participatory methods involved an ongoing adaptation of the method during the investigation. Thus, it has often been problematic in the interpretation of the results to combine chronological evolution (providing increased precision data obtained) and thematic classification of the data. Some key information, such as social historical shift between villages 1 and 7 and the others, were only included as the last phase, after repeated interviews with various key informants. However, continuous treatment of the data brought some relevance to how to conduct the fieldwork.

The creation of a database need to strike a difficult balance between reproducible methods used to obtain systematic and rigorous data and our willingness to keep an approach open and participatory. This forced us to make difficult choices, obscuring some interesting tracks in favor of interpretable results. In addition, the study appears to us now as open initially and increasingly restrictive along the survey. Farmers seem to us to participate in a limited way to surveillance at the beginning, having lost their confidence in the veterinary services. But at the last stage, they said they would report a suspected case even if the compensation is absent. Knowing that the observation at the last step was very directive (see Annex 4), we wonder if farmers have not felt compelled to affirm an unconditional participation to surveillance (in particular during group sessions). Understanding of the decisive factors for reporting could therefore be just begun and also requires further exploration in the context of a long-term study on a scale encompassing all social networks in which the villagers are involved. The monetary quantification of social factors impacting surveillance could not be carried out due to agenda constraints. But also, monetary variables such as financial compensation from the government or the price of a fighting cock could not be used because even without compensation and low value cock, farmers would declare a case. These tracks
discovered at end of the study may require further elaboration, in light of the tools related to stated preferences, which could be tested in this community. Let’s note that the REVASIA program plans to further explore these research pathways in 2012-2013 as part of a PhD thesis in progress.

Social factors involved in the community choices

In general, health problems do not seem to be a priority for farmers. Whereas infectious and contagious diseases do little concern in daily activities (from the example of canes layers), pesticides used for rice culture are the leading cause of death among domestic cane and represent a major economic issue for farmers. These environmental issues are likely to rise given the global changes (Trébuil, 1993) which affect agriculture and therefore the rural communities. Those neglected settings should also be considered by local veterinary services, for example to study the possibilities of helping farmers to cope with these challenges, which threat widely, like diseases, animal health. Duck farmers are clearly asking for more help on the prevention and management of health problems by the authorities, especially during critical periods such as floods or seasonal change, which both gather good condition for disease emergence and transmission.

It has been shown that dominant families of political and economic life, at the interface between the villagers and the government (including veterinary services), control the pathways of information spread and decision-making locally. In addition, the role of these powerful people in a major crisis, such as an outbreak is likely to be prominent. These leaders must be a special target in research and development projects on surveillance and animal health management. The elite can help create a network in which information circulates very rapidly, while promoting the general surveillance. However, we must be aware that the power of a few people is able to stop the communication to competent authorities which would be judged as a hazard for the community (e.g. the declaration of suspected disease that would call for the slaughter of all the animals around). This exploratory work could recommend to accept that coexist two major complementary surveillance systems, one formal and managed by government authorities, and the other, "informal" run by an oligarchy and governed by socio-political and socio-economic standards. These two systems are not necessarily antagonistic. To the contrary, we should probably try to make the most of their potential synergies. This would imply, from the state authorities and international experts, to agree to cease to the local oligarchy a part of their control on the dynamics at work.

Moreover, it is clear that the major industrial groups such as CP exercise their own surveillance and control farmers individual choices. However, they communicate better and better (since the last crisis H5N1) with the DLD. Still, a better effort of transparency would be desirable in order to ensure an efficient cooperation between the surveillance of large and small farms for avian and swine sectors because both contribute to the risk of spread of disease like influenza.

The evocation of the H5N1 episode of 2004-2005 has generated a cloud of controversial information. The trauma massive slaughter is still present today in the village population but also among veterinarians. DLD now show the will to better communicate to regain the trust of farmers, now convinced of the usefulness of the measures taken at the time.

The villagers' attitude toward the declaration of a suspect case is extremely ambiguous with regard to the data we collected. Besides, the minimum average mortality rate which leads farmers to suspect a case is much higher (40%) than the 5% recommended by veterinary services. Thus, whereas in times of outbreak,
everyone actively supports measures of DLD, few breeders would assume to be the trigger for such a situation by declaring at first. Fighting cocks escape or delocalization of farmers themselves after an outbreak indicates that there is some social and economic costs of surveillance and especially control measures. However, there is another social cost of non-participation for surveillance and control, which is seen as a refusal to comply with everyone’s duty. More substantial compensation may be a solution to explore by ministries, insofar as there may be a threshold beyond which economic imperatives take precedence over social pressure, as seen in Figure 9. Scenarii could be tested to predict the reaction of the people in the re-emergence of HPAI viruses. As part of a further study, the REAVSIA team could go beyond the formal speech in the cultural context of Thailand.

After identifying the social factors involved in small-scale surveillance in Thailand, one of the great opportunities of our study is the need to model the local system that goes around animal health and surveillance. Indeed, we have shown that we are dealing with a high degree of complexity. It is now necessary to visualize the dynamics and main interactions in order to produce recommendations for improving the quality of surveillance activities. Modeling (ComMod, 2005) seems to be appropriate in this case, as it creates models proposed by and for local communities, and would not ignore different social norms of other villages with a larger scale of study. Social determinants which have been well identified here need to be quantified to really know which impact they represent toward surveillance actions. The two pilot studies in Thailand and Vietnam showed significantly different results. Indeed, in Vietnam, the social norm is totally opposed, with a different value for information about animal health. These differences draw attention to the importance of the national context and local social norms at work and on the factors influencing a surveillance system.
REFERENCES


Annexe 1: List of key informants interviewed.

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief of sub-district of Ban Mai (Kamnan) and assistants</td>
</tr>
<tr>
<td>Chief of village 7 (Puyai) and assistants</td>
</tr>
<tr>
<td>Chief of DLD (province of Sukhothai)</td>
</tr>
<tr>
<td>Chief of animal health department DLD (province de Sukhothai)</td>
</tr>
<tr>
<td>Chief of DLD, district office</td>
</tr>
<tr>
<td>Veterinarian of district (DLD)</td>
</tr>
<tr>
<td>Chief of development department of district</td>
</tr>
<tr>
<td>Doctor in chief of public health department of Ban Mai</td>
</tr>
<tr>
<td>Cow market owner of Doong Khow</td>
</tr>
<tr>
<td>Food and drug seller of Phitsanulok</td>
</tr>
<tr>
<td>Chicken trader of Kai Kran</td>
</tr>
<tr>
<td>Cow and chicken trader of Ko Krat</td>
</tr>
<tr>
<td>Cocks fights organizers of Ko Krat</td>
</tr>
<tr>
<td>Traditional doctor of village 1</td>
</tr>
<tr>
<td>Livestock volunteers of Ban Mai and Ta Cha Nuan</td>
</tr>
<tr>
<td>Chicken farmers CP of Hand Dong</td>
</tr>
<tr>
<td>Monk from temple village 1</td>
</tr>
<tr>
<td>Zootechnician CP in charge of Ban Mai pig farms</td>
</tr>
<tr>
<td>Veterinarian CP based in Bangkok</td>
</tr>
</tbody>
</table>
Annexe 2: Participatory epidemiology tools used during the fieldwork.

<table>
<thead>
<tr>
<th>Field step</th>
<th>Tool used</th>
<th>Number of times</th>
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<tbody>
<tr>
<td>1</td>
<td>Proportional pailing</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Mapping</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Seasonnal calendar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Matrix scoring</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Flow diagram</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Proportional piling tree</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Mapping</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Tags</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Proportional piling</td>
<td>8</td>
</tr>
</tbody>
</table>
Annexe 3: Disease impact matrix scoring.

<table>
<thead>
<tr>
<th></th>
<th>Income</th>
<th>Food</th>
<th>Leftovers</th>
<th>Fertilizer</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>11</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>14</td>
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<tr>
<td>Anorexia</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Ataxia</td>
<td>27</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>Nasal discharge</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>25</td>
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<tr>
<td>Death by pesticides</td>
<td>77</td>
<td>9</td>
<td>4</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>Sudden death</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>169</td>
<td>9</td>
<td>8</td>
<td>14</td>
<td>200</td>
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</table>
Annexe 4: Example of results from an interview with fighting cocks farmers on the decision making to declare with different scenarios.

<table>
<thead>
<tr>
<th>Situation (100 cks)</th>
<th>Report by own decision</th>
<th>Don’t report by own decision</th>
<th>Discuss with other people (puyai, other ck farmers, LV, HL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40% mortality in 1 day - No comp*</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>-40% in 2 days - No comp*</td>
<td>51</td>
<td>21</td>
<td>28</td>
</tr>
<tr>
<td>-40% in 2 days - 20b/ck comp*</td>
<td>73</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>-40% in 2 days - 10b/ck comp*</td>
<td>73</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>-30% in 2 days - 20b/ck comp*</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>-30% in 2 days - 30b/ck comp*</td>
<td>0</td>
<td>73</td>
<td>27</td>
</tr>
<tr>
<td>-30% in 2 days - 70b/ck comp*</td>
<td>36.5</td>
<td>36.5</td>
<td>27</td>
</tr>
</tbody>
</table>
Annexe 5: Chiefs of Khums multiple responsibilities

<table>
<thead>
<tr>
<th>Khum</th>
<th>Chief’s functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Former Livestock volunteer), collect electricity+water tax in all village, minibank manager, health volunteer, gym teacher, development project volunteer (1/tambon)</td>
</tr>
<tr>
<td>2</td>
<td>Puyai assistant</td>
</tr>
<tr>
<td>3</td>
<td>Sport life manager</td>
</tr>
<tr>
<td>4</td>
<td>Chief of “women community”, minibank manager, health volunteer</td>
</tr>
<tr>
<td>5</td>
<td>(Former puyai’s daughter), puyai assistant, minibank manager</td>
</tr>
</tbody>
</table>
Annexe 7 : Example of proportional piling tree.

How many ducks stayed healthy for one flock during the past five years in average?

How many ducks got sick or dead?

Then, what are the causes of sickness or death? Show the relative importance of each cause.