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HPAI PRO-POOR HPAI RISK REDUCTION

# Assessment of Smallholder Indigenous Poultry Producer Viability in Thailand

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Mekong Team Working Paper No. 9

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# Preface

Since its emergence, H5N1 HPAI has attracted considerable public and media attention because the viruses involved have been shown to be capable of producing fatal disease in humans. While there is fear that the virus may mutate into a strain capable of sustained human-to-human transmission, the greatest impact to date has been on the highly diverse poultry industries in affected countries. In response to this, HPAI control measures have so far focused on implementing prevention and eradication measures in poultry populations, with more than 175 million birds culled in Southeast Asia alone.

Until now, significantly less emphasis has been placed on assessing the efficacy of risk reduction measures, including and their effects on the livelihoods of smallholder farmers and their families. In order to improve local and global capacity for evidence-based decision making on the control of HPAI (and other diseases with epidemic potential), which inevitably has major social and economic impacts, the UK Department for International Development (DFID) has agreed to fund a collaborative, multi-disciplinary HPAI research project for Southeast Asia and Africa.

The specific purpose of the project is to aid decision makers in developing evidence-based, pro-poor HPAI control measures at national and international levels. These control measures should not only be cost-effective and efficient in reducing disease risk, but also protect and enhance livelihoods, particularly those of smallholder producers in developing countries, who are and will remain the majority of livestock producers in these countries for some time to come.

With the above in mind, this document presents and discusses the results of a survey-based assessment of the viability of indigenous poultry producers after HPAI outbreaks in Thailand.

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# Disclaimer



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## Keywords

Poultry Certification, Disease Risk, Risk Reduction, HPAI, Avian Influenza, Chickens, Markets, Poverty Alleviation.

## More information

Please refer to the project website at www.hpai-research.net

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# Executive Summary

This working paper discusses a survey-based assessment of the viability of indigenous poultry producers after HPAI in Thailand. Although Thailand has the most advanced and extensive modern poultry industry in the Mekong Region, backyard smallholder production remains ubiquitous among the country's rural poor majority. This group has been adversely affected by both HPAI outbreaks and control measures taken in response to them. These survey results can inform policymakers about the design of more socially-effective responses to HPAI and other animal disease risks.

**Study Rationale**
Thailand's poultry sector has been in dynamic transition for a generation, and now exhibits a dualistic structure, with highly concentrated industrial production supplying large urban and export markets while backyard poultry dominate the rural landscape. As long as rural poverty remains extensive in the country, strong incentives for home production and consumption of poultry will persist. For this reason, policy makers must decide whether backyard poultry will simply be an emblem of poverty, or whether measures should be taken to improve poultry production's capacity to contribute to smallholder incomes. The latter would include promotion of market access and product quality, including animal health, which captures more value-added for small farmers and potentially more income for poor rural households.

**Research Activities**
Recent events associated with HPAI outbreaks, including control measures adopted in response to them, appear to have seriously upset the gradual transition of the Thai poultry sector. To better understand these impacts and their implications for the viability of smallholder farmers across the country, this study conducted a series of detailed surveys in and around three provincial capitals in Thailand. A set of five surveys have been carried out in three provinces spanning the poorest (North and Northeast) regions of Thailand.

**Main Project Findings**
Detailed investigations of the smallholder poultry supply chain, based on interviews with consumers, farmers, ex-farmers, farming networks, traders, and vendors, suggests that recent changes in market conditions, as an indirect result of the HPAI outbreaks, are making it very difficult for small-scale poultry farmers to sustain their rural enterprises. Our observations indicate that, despite the absence of large outbreaks since mid 2004, there have been significant movements out of the native chicken sector during 2006 and 2007. Households who grew chicken in the past continue to do so for own consumption, but they presently see sharply diminished prospects of a livelihood from this form of livestock. In particular, our results suggest that smallholder poultry could continue to contribute to local markets and nutritious diets; that Thai consumers still exhibit clear preferences for local varieties; and that these market opportunities could in turn make important contributions to rural poverty alleviation. It is also apparent from our results that smallholder farmers are linked to downstream consumers through networks of low income intermediary enterprises, meaning that their continued economic viability secures pro-poor multiplier effects on the Thai economy.

**Policy Recommendations**
For the abovementioned reasons, we recommend that this evidence be more fully considered in policy forums to formulate socially-effective and sustainable HPAI strategies, particularly if the disease is endemic. Poultry sector transition will surely continue in Thailand, but abrupt changes could destabilize livelihoods among the country's economically vulnerable rural majority.

The detailed findings from three regional poultry markets indicate a broad spectrum of socially constructive policy options that will reduce HPAI risk while improving economic conditions for poor

farmers who are the majority population in rural Thailand. To begin with, the government can reinforce the efforts of farming groups that currently practice safe production practices, while actively recruiting farmers interested in doing so. These efforts can be modelled on agricultural producer cooperatives, who are the primary guarantors of product quality and safety in OECD countries.

Access to information and technology can be improved for smallholder farmers, particularly with respect to product quality, pricing, and other market conditions. On the financial side, micro-credit schemes can accelerate technology adoption and small enterprise modernization, improving product quality/reliability and leading eventually to established brands/reputation that confer higher long term value added at lower transaction cost. Professional training is also important, especially for product certification and enforcement of standards with veterinarians and technicians. Similarly, rudimentary education with respect to contracting, negotiation, and conflict resolution would improve the terms of smallholder market participation.

Local officials need to be better informed about the socioeconomic benefits of sustainable smallholder supply chains. The government can play a critical constructive role in these pro-poor supply networks by supporting grassroots producer cooperation, extension services, and generally maintaining an environment congenial to small enterprise development. This would include, but not be limited to, strengthening of veterinary institutions, providing intellectual property protection, supporting development of third-party standards and reputation building through labelling or branding programs, improving existing market infrastructure, and developing small wholesale markets with registered slaughterhouse facilities in strategic urban locations.

The willingness-to-pay results of the surveys indicate that consumers place a significant premium on traditional poultry varieties that have historically been produced by smallholders. This means that many of the product development and upgrading initiative we propose could eventually be self-financed, a welcome substitute for open-ended fiscal commitments to public disease monitoring and geographically extensive control measures. Willingness to pay for traditional poultry also suggest that the general public have a distinct preference for sustained production of traditional varieties, contradicting the pressures from conventional HPAI policy to phase out this product.

# Introduction

Globalisation has brought an unwelcome problem – increased risk of transboundary diseases. HPAI clearly illustrates that through extending livestock supply chains, local conditions of animal production have repercussions on global human health risks.

For a vast majority of rural households in developing countries, poultry act as an important source of protein and are part of the social fabric, a situation which will not change in the near future. Therefore, global policies toward HPAI and its control necessarily implicate the rural poor majority and these people need to be recognized as part of the solution to reducing human health risk, not the problem.

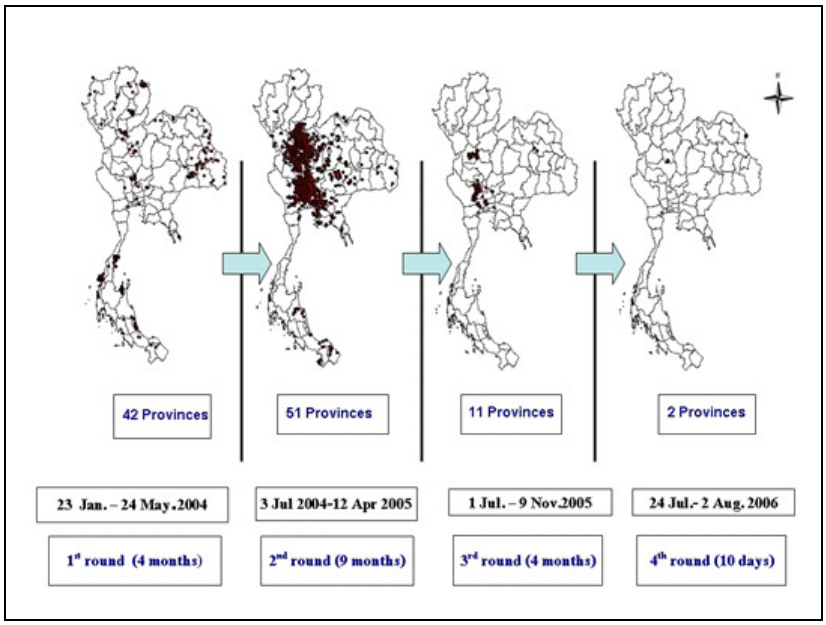
It has been seen time and time again that prescriptive eradication measures fail to achieve their direct objective and that by driving the problem 'under ground', disease risk actually increases. Because of their diversity and weak institutional linkages in most of the affected countries, national policies cannot be designed and implemented effectively without close attention to local incentives. Despite international pressure to act quickly on control measures, one size will not fit all or even a significant percentage of local conditions. To ensure effective, affordable and socially fair HPAI control programmes, national and international policy making needs to be based on stringent analysis of risks, consequences and risk management options.

This report discusses the results of surveys assessing the viability of indigenous poultry producers after HPAI in Thailand. A set of five surveys were carried out in three provinces (Chiang Mai, Khon Kaen, and Nakhon Phanom) spanning the North and Northeast regions of Thailand.

## HPAI in Thailand

Thailand has experienced four waves of Avian Influenza outbreaks. The first wave (23 January –24 May 2004) affected 42 provinces, and resulted in 320,000 birds being culled. The second wave (3 July 2004-12 April 2005) led to 63,000,000 bird culls in 51 provinces. The third wave (1 July- 9 November 2005) affected 11 provinces and resulted in 450,000 birds being culled. The fourth wave (24 July-2 August 2006) affected 2 provinces and resulted in a limited number of culls.

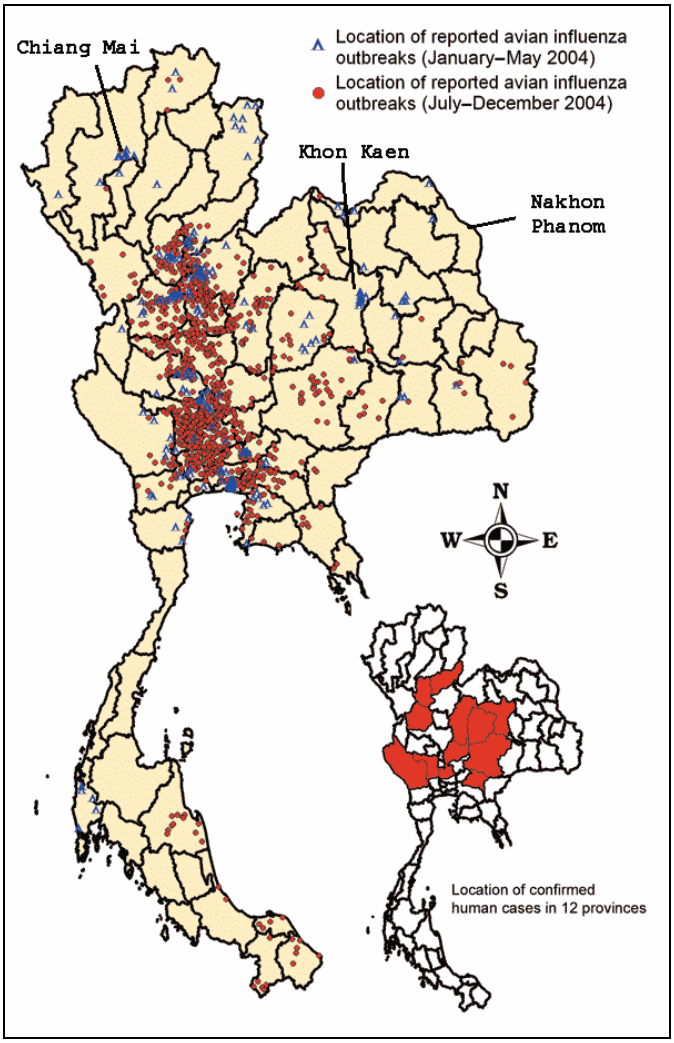
**Figure 1**. HPAI outbreaks in Thailand, 2004-2006.




***Source:*** Department of Livestock Development (DLD) - Thailand

**Chiang Mai**, a city in north Thailand, had four reported outbreaks during the first wave and one during the second wave. **Khon Kaen** had six reported outbreaks during the first wave. **Nakhon Phanom** had one reported outbreak during the fourth wave of outbreaks. Khon Kaen was the only location of the three sites to have a confirmed human case of HPAI (see Figure 2).

**Figure 2.** Locations of reported outbreaks in Thailand, 2004.




***Source:*** Tiensin *et al.* (2004)

The poultry sector has been widely acknowledged as the greatest agribusiness success story in Thailand. In 2005, poultry was estimated to comprise 52 percent of total meat production in Thailand (NaRanong, 2007). The sector has transformed itself over the past four decades from near universal backyard farming into a leading poultry exporter. Today, Thailand has one of the most advanced broiler sectors, with levels of efficiency and overall performance equal or exceeding that of most other international systems (Jaffee, 1993). In turn, production and consumption of poultry have greatly increased over the past few decades. Per capita consumption of chicken meat rose from 2 lbs per year in 1970 to 22 lbs per year in 1992 (Willis and Goldberg, 1992). As a result of decreasing prices, increasing incomes, urbanization, and improved market availability, chicken has become the most affordable and most popular source of meat in Thailand (Costales *et al.*, 2005).

## Government HPAI Containment Efforts

According to the Department of Livestock Development (2006a), official HPAI containment policy has consisted of three phases (different from the waves of outbreaks). During the first phase (23 January-10 February 2004) diagnosis was based on positive HPAI tests and the policy entailed having all poultry, products, feed, bedding, waste and manure from infected flocks destroyed immediately.

Furthermore, the policy dictated that all flocks within 5 kilometres of confirmed cases were pre-emptively culled. Because of the widespread nature of the outbreaks, the normal 75 percent of market value compensation for culling was raised to 100 percent of market value. Market prices were based on the breeds and types of birds.

During the second policy phase (11-29 February 2004) a new procedure for diagnosing HPAI was implemented in addition to laboratory testing. Under the new definition, a "case" was defined as any positive test, any instance where poultry death rate in a flock was >10 percent within a single day, or any instance where the death rate in a flock exceeded a cumulative >40 percent over three days and the flock displayed other signs of infection (e.g. diarrhoea, ruffled feathers, depression, etc). Flocks considered to be positive were to be culled with the normal compensation of 75 percent market price. The new policy also called for pre-emptive culling within a reduced 1 kilometre radius. A flock was defined as "a farm unit or village".

Since the second phase ended, the definition of a "case" has remained the same but pre-emptive culling has been eliminated. Now, the re-evaluated policy mandates that only those flocks considered cases are to be culled and flocks within a 5 kilometre radius are to be tested.

Many farmers have pointed out that, in addition to culling, the containment policy included demolition of backyard structures that had housed chickens. Farmers were not compensated for the loss of these structures. In addition, most interviewees believe that in practice a 10 kilometre radius was used for pre-emptive culling. However, the official 5 kilometre radius is the maximum allowed by law in Thailand (Tiensin *et al.*, 2005). One potential explanation is the policy definition of a flock as a farm or village. One village can contain hundreds of open backyard farms and if they are classified as a single flock, because of potential interactions between chickens within the village, then 5 kilometres from the edges of the flock could easily stretch to 10 kilometres or more.

Finally, as expected, levels of compensation for culling were controversial among farmers interviewed. We have spoken with farmers in at least three villages who mentioned that they did not receive the full compensation as they were promised. Also, a few farmers in remote areas reported receiving no compensation at all for their culled flocks. In addition, the method of compensating solely based on breeds kept meant that farmers with small birds were paid greater than market price for their chickens and farmers with large birds were paid less than market price.

The main complaint expressed about the containment policy, however, has been the destruction of chicken housing structures without compensation. Insufficient capital to restart farming ventures, in addition to the newly perceived risk of future outbreaks and potential government containment measures, are common reasons cited as to why farmers did not rebuild and resume farming after their flocks were culled.

## Farmer Credit

Previously, the main source of formal credits for small- and medium-scale farmers was the BAAC or more formally known as the Bank of Agriculture and Agricultural Cooperatives (Fitchett, 1999). The Thai government has majority ownership in the bank. After 2004, the BAAC created new guidelines for issuing credits. Included in these new requirements were that farmers needed to register with the

DLD, be part of a farmer association, be in control of the entire production cycle (hatching, raising, and slaughtering) and exhibit good farm management techniques (BAAC, 2007).

While some farmers were issued loans after the outbreak, conversations with farmers suggest that sometime in late 2005 or early 2006 "good farm management" began being interpreted as poultry farming with a closed system in order to prevent disease outbreak. According to farmers, a closed system eventually became an 'unofficial' precondition for issuing loans. However, constructing a closed farming system costs approximately 200,000 baht (US$6,000). As it was a precondition, farmers reported that they were not allowed to take out loans to finance the (re) building of a closed grow-out system.

While informal lending exists, the cost of capital tends to be greater and thus informal loans are generally much smaller (Gine, 2006). Moreover, with limited production capacity, the cost of building a closed system generally outweighs the benefits for small-scale farmers.

It is likely that these new guidelines made it difficult for many farmers to continue financing their backyard farms and thus contributed to a significant movement out of the small-scale poultry sector in 2006 and 2007. Like the farmers who did not rebuild their flocks after they were culled, farmers who abandoned farming in the past two years often cite insufficient capital as a common reason for abandoning their ventures. A second job was the most common source of capital among the farmers that we spoke with who continue to farm today.

## Farmer Adaptation: Low-Cost HPAI Prevention Measures

After the HPAI outbreaks, smallholder producers have been forced to come up with cost effective methods for preventing the spread of disease. One method that has been utilized by farmers in Chiang Mai is raising chickens in separate cycles. Previously farmers raised chickens all year round, at various ages, and sold mature birds for constant flow of income. Now some people have begun raising a single clutch and selling all of their chickens at once so that they can clean and disinfect their facilities between each cycle. In this system, chickens are not raised during the winter because farmers believe the coldest months are when their birds are most susceptible to disease. This may help to explain, in part, the discrepancy found between late October and late December in the number of native chickens available for market in Chiang Mai. November and December are two of the coldest months and some farmers were cleaning out their facilities before raising another clutch beginning in mid January.

Other inexpensive precautions observed included keeping adult chickens in cages on tree branches, to prevent the spread of diseases on the ground, and the relocation of chicken-holding facilities to sites further from farmer's home. We did not observe vaccine usage. When asked, most farmers reported that vaccines were either unavailable or too expensive given their slim profit margins.

## The Role of Large Private Enterprises

Contrasting experiences were reported in Chiang Mai, Khon Kaen, and Nakhon Phanom regarding conversion of native chicken farms into contract farms for large integrated companies. A number of the larger native chicken farms in Chiang Mai, after the HPAI outbreaks, switched to broiler production and entered contracts with large integrated producers. Farmers cited access to credit and risk reduction as the main reasons they agreed to contracts. However, farmers in Khon Kaen reported that such contracts had been more available before the HPAI outbreaks, and that some large integrators now require closed farming systems to be in place before discussions of a contract can begin. None of the farmers we spoke with in Nakhon Phanom reported having contracts with large companies. It seems likely that contracts with companies have become more available for larger farmers who can afford to build closed systems and less available for small or medium scale

farmers without the capacity to build such a system. One industrial representative mentioned that the company had problems in the past with small farmers taking chickens to market themselves, rather than selling the birds back to them as specified in the contract. These same problems were less common with large native chicken farmers.

In addition to the movement of native chicken producers into their broiler production system, for the first time in 2007, large integrators began selling native chickens under their brand name in central Thailand. It has been reported that they plan to expand into the northern and north-eastern parts of the country in the next few years. The industry representative who described the pilot programme said that the native chicken contracts are similar to the long existing broiler contracts; the integrator provides chicks, vaccine, technical assistance, and feed, then the farmer raises the chicken and sells them back for a predetermined price. The size of these native chicken farms under contract was unclear. Regardless, it seems likely that small farmers in the poorer northern and north-eastern regions will have to compete directly with industrially branded native chickens in the near future.

## Advertising and Demand for Native Chicken

In response to the HPAI outbreaks, the Ministry of Public Health of Thailand conducted a public awareness campaign focusing on the dangers of handling and consuming infected chickens. One particularly visible feature of the campaign was the airing of television commercials in February 2004 (a study in Nakhon Phanom Province found that 91 percent of respondents first heard of HPAI on television [Olsen *et al*., 2005]). Local news outlets (radio, newspaper, and television) also covered the outbreaks extensively. Some farmers felt that the Ministry of Public Health focused their campaigns, and particularly the commercials, too heavily on the dangers of consuming native chicken rather than the dangers of consuming chicken in general.

During the same period, industrial producer commercials highlighted the company's safety standards in their advertising campaigns. Some farmers noted that they have always felt disadvantaged because of their inability to effectively market native chicken. Consumers apprehension brought about by the HPAI outbreaks has increased the importance of safe-chicken marketing. Many believe the combination of Public Health Ministry announcements and industry advertisements have focused these apprehensions disproportionately onto consumption of native chicken vis-à-vis industrial ones.

Among farmers who continued to raise native chickens for market after the HPAI outbreaks, many have since ceased to sell their product because of this perceived decrease in demand. Many people unaffected by culling have also decreased the size of their flocks and ceased to market their chickens, selling only to traders who come to their homes asking to purchase a few live native chickens/ducks.

Further investigation, based on interviews with consumers, farmers, ex-farmers, farmer networks, traders, and vendors, suggests that recent changes in market conditions, as an indirect result of the HPAI outbreaks, are making it difficult for small-scale poultry farmers to sustain their rural enterprises. Our observations suggest that, despite no occurrences of HPAI in Chiang Mai since mid 2004, there have been significant movements out of the native chicken sector during 2006 and 2007.

This working paper summarizes our survey results and evaluates the conditions presently facing smallholders in Thailand. It is not intended to serve as evidence of widespread problems, but instead to draw attention to livelihood issues that should be considered while the sector is in transition.

# Project Activities

The following sections detail the activities that took place prior to carrying out surveys. These activities included reviewing existing lists of farmers, conducting background interviews, and selecting provinces to be included in the survey.

## Survey Strategy

Initial attempts to conduct a Pro-Poor Livestock Policy Initiative (PPLPI) farmer survey in Thailand using a Department of Livestock Development (DLD) frame from April 2005 were unsuccessful despite the existence of regional DLD data from April 2006 that suggested similar levels of farmers were operating in the Chiang Mai area. Upon discovering the problems with the survey frame, the survey was adapted by randomly selecting villages and contacting village heads in order to locate poultry farmers. That system, however, was also unsuccessful because many village heads reported that their villages no longer had any farmers that raise chickens for income. However, it was later discovered that village heads were used by the DLD to locate farmers for chicken culls during the HPAI outbreaks. Therefore, it is in the farmers' interest to keep their activities hidden from the village heads. Additional concerns arose when wet market surveys in late December 2007 identified 30 percent less native chicken vendors among the markets which had previously been visited in late October (9 and 13 vendors respectively, from 14 markets).

### Number of Farmers

For the purposes of this section, only those people who raise chicken for income are referred to as farmers. In order to investigate current conditions, informal interviews were conducted in 32 villages in six cities around Chiang Mai city. Farmers raising native chicken were located in 20 of the villages (63%). Most often, the number of farmers located was around ten; however, in six villages less than five farmers could be located. In every village where farmers were located, the current number was significantly less than listed in 2005.

About half, or 17 of the villages visited (53%), had never experienced any HPAI related culling. Of these villages that did not have direct experiences with HPAI outbreaks, farmers could not be located in four villages. In all four of these villages farming activities were reported prior to 2006 and decrease in demand was the main reason cited for abandoning poultry farming.

Fighting cocks were present in all 32 villages visited. Many people told stories of hiding their prized fighting cocks while culling was taking place in their area. Other anecdotes heard repeatedly, but not discussed below, include elderly farmers complaining that their children moved to the city to find off-farm work and the expression of general distrust of the government and its intentions.

In addition to Chiang Mai, interviews were conducted in Khon Kaen and Nakhon Phanom. In Khon Kaen, three villages were visited on the recommendations of market vendors. We were able to locate seven farmers, all from the same village. In the other two villages, chickens were sold to traders but were raised for the primary purpose of home consumption. Some of the larger farmers in Khon Kaen reported switching from poultry to beef or pork production after the HPAI outbreaks.

Additionally, three villages in Nakhon Phanom were visited with similar observations. Farmers were located in two of the villages, albeit less than five in each. Interviews in Khon Kaen and Nakhon Phanom indicate that farmers in all three areas face similar problems; lack of capital, diminished demand, and new farming regulations that are difficult for smallholders to comply with.

In order to locate farmers, in addition to visiting villages, farmer networks in all three areas were contacted by phone. However, most of the native chicken farmer networks and associations that

were contacted have disbanded. One network was found in Nakhon Phanom but it maintains only three active members. Three networks were found based in Khon Kaen; however, none of these networks consists of more than seven chicken farmers. None of the networks that were registered with the DLD in 2006 were found to be active in either Khon Kaen or Nakhon Phanom. The three Khon Kaen networks all consist of pig and cow farmers in addition to the aforementioned chicken farmers. In Chiang Mai, eight networks were found, four of which are registered with the DLD. Seven networks consist of three to ten farmers in a single district. The eighth network began in Chiang Mai and has since expanded into other provinces across Thailand. In Chiang Mai province the network averages 50 members per city (20 cities in the province). This network also has ten members spread out across Khon Kaen province but has no members in Nakhon Phanom. These findings suggest better organization among farmers in Chiang Mai as compared to other regions (DLD, 2006b).

Among the 12 villages observed in Chiang Mai, where no households that raise chicken for market were located, every village had some households that kept chickens for home consumption. In some cases, no household raised chickens for sale but every home had chickens for home consumption. All of the six villages visited in Khon Kaen and Nakhon Phanom had numerous households who raised chicken for consumption. Most people, regardless of their purpose for raising chickens, are willing to sell a few chickens if approached by traders and/or middlemen with an attractively reasonable price.

From our observations it appears that abandoning raising chicken as a source of income has not led most people to give up the practice of keeping chickens to supplement their diet. These findings are encouraging because they suggest that, were markets to be reinstated or expanded, many people would be able to return to producing native chicken for ancillary income generation.

**Conclusions**

After the HPAI outbreaks, many farmers ceased to raise chickens for sale. Moreover, decreased demand and changes in regulations have prompted many more farmers to abandon their ventures in the years following the initial outbreaks. Despite large movements out of the smallholder sector, people continue to raise chickens for market, especially in more rural areas. In addition, the vast majority of households that farmed in the past continue to raise chickens for home consumption.

After talking to farmers in all three locations, Chiang Mai emerged as the best site to conduct the surveys. Extensive poverty, continued native chicken production, and an extensive network of wet markets make Chiang Mai province a potential survey site. Higher degrees of farmer organization, a suspected higher density of farmers, and the existence of previously established contacts make Chiang Mai the most practical location as well. Moreover, the absence of HPAI outbreaks since 2004 means that current condition in Chiang Mai may be more similar to future conditions in Thailand. Khon Kaen's experience with a human outbreak and Nakhon Phanom's more recent outbreak likely make HPAI fresher in the minds of consumers. Because of these changing conditions, however, no reliable farmer survey frame is available in any location. A creative sampling method was used to maintain statistical integrity while utilizing the many contacts with farmers and networks that have been established during this investigation. In addition, the originally planned survey area was expanded. This expansion also created a more regionally representative dataset because of the diverse conditions characterizing Chiang Mai province. Moreover, the questionnaire was revised to better reflect current market and living conditions.

While these developments made expansions of the timeline and the budget necessary, the potential rewards of a reliable dataset were substantial. Changing conditions mean that past studies have not addressed current market problems. Not only do the remaining farmers stand to benefit from changes in policy, but also those who continue to raise chickens for consumption, were they to re-enter the market successfully.

## Survey Site Selection

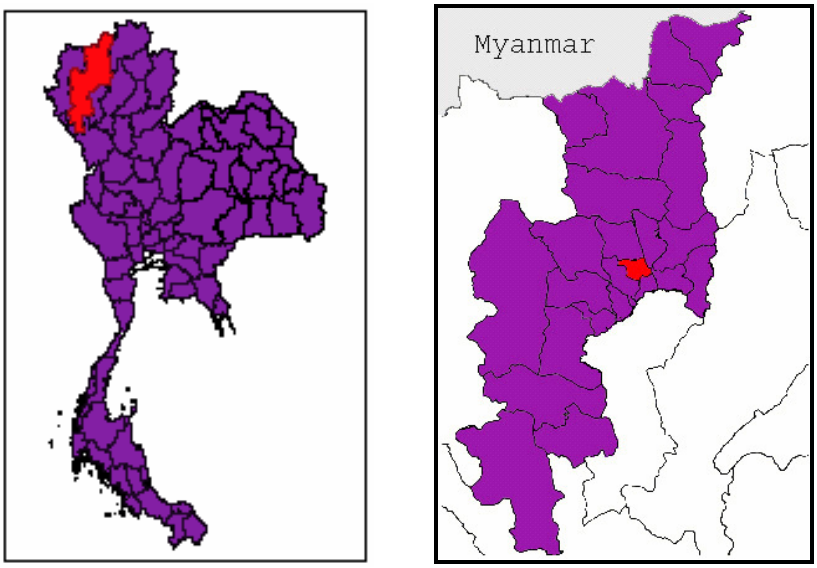
Three sites were selected as potential areas for the pilot survey of the poultry market, as part of the larger project in the Mekong region. Thailand's position is unique in the region in that it already has a highly developed and successful livestock industry. For this reason, focus of the Thailand survey has been shifted to smallholder native poultry production in order to more effectively pursue the project's goal of poverty alleviation through livestock policy and institutional change. An urban location is desirable in order to ensure markets are available to collect sufficient amounts of data. The ideal site would also have significant smallholder native poultry production, markets for the sale of birds, and high levels of poverty.

With this in mind three sites were selected from Thailand's poorest regions; the north and the northeast. Both regions have numerous urban centres in proximity to rural agricultural land with high levels of native chicken production. From these regions the sites of **Chiang Mai** (north), **Khon Kaen** (northeast), and **Nakhon Phanom** (northeast) were selected for their distinctive features. Each site was visited by a researcher in order to better understand the markets that sell live poultry.

### Chiang Mai Background Information

Ampur Chiang Mai is the unofficial capital of northern Thailand. Long considered an essential tourist destination by Thais nationwide, Chiang Mai was identified in the 1970s by the national government as a regional growth pole and invested in heavily. The district is home to two universities; the small private Payap University and the 20,000 student public Chiang Mai University. Chiang Mai University was part of the first group of universities established outside of Bangkok in 1964 and maintains its status as the northern region academic hub.

**Figure 3.** Maps of Chiang Mai province and district.




Chiang Mai Province | Chiang Mai District

The rise of Mr. Thaksin Shinawatra, a native of Chiang Mai, to Thailand's prime minister reinstated Chiang Mai at the forefront of national politics in 2001, and the city was one focus of a Thaksin-sponsored development plan. For these reasons, among others, the district of Chiang Mai has seen significant development over the past decade and continues rapid expansion. However, as a province, Chiang Mai continues to be largely underdeveloped and is home to a significant rural population including many hill tribes who live in the province's mountains and speak languages (or dialects) other than Thai.

**Geography**: Chiang Mai province (changwat) is located 700 km northwest of Bangkok. It is the largest province (by area) in Thailand's northern region, and the second largest province in the country. It boarders Myanmar to the north and is mountainous in topography with an average altitude of 310m. Chiang Mai province is also the location of Doi Inthanon, the highest mountain in Thailand (2,575m).

The climate is considered to be seasonal monsoon which entails heavy rainfall in the season of the southwest monsoon (from mid-May to October) and arid in the winter. This geography means that Chiang Mai experiences Thailand's longest dry season which generally lasts around six months. The capital district is geographically typical for the province. Located directly west of the city is Doi Suthep Mountain (1,676m) and the Mae Ping flows through the eastern part of the district after originating in the Chiang Dao mountain range.

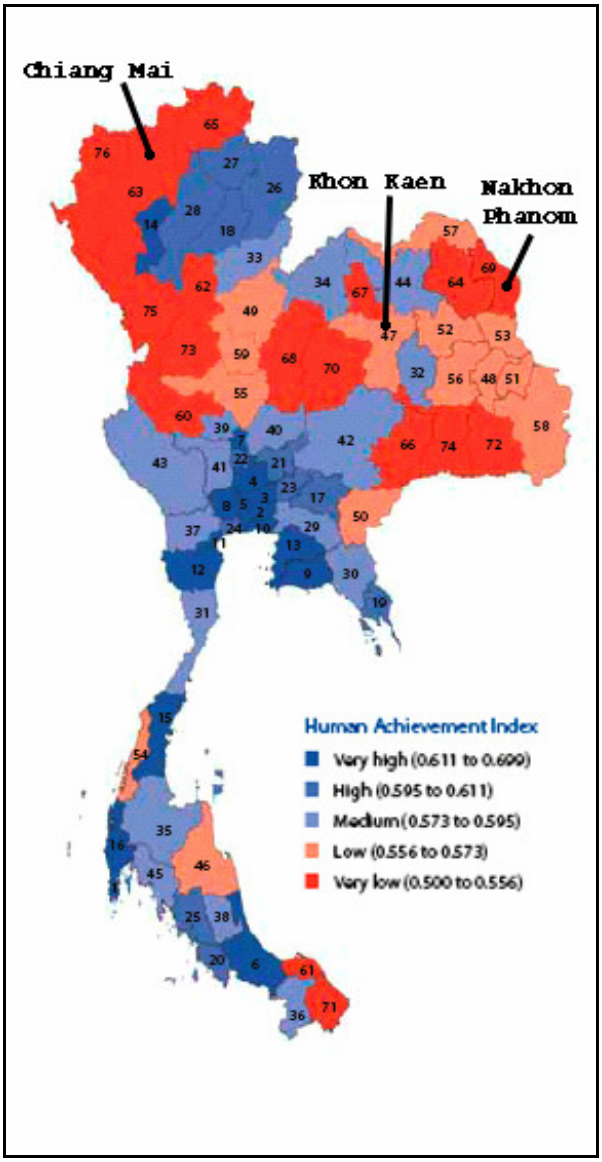
**Population**: Population data is available at the district (ampur) level and provincial (changwat) level from the 2000 National Statistics Office Population and Housing Census.

Chiang Mai, and the surrounding districts, collectively makes up one of the nation's largest urban areas, second in population only to Bangkok. In 2000, the Chiang Mai district itself had a population of 242,974. However, when including the neighbouring districts (which collectively constitute the 'city' of Chiang Mai) the population reached close to 700,000. The district population was 70 percent urban and 30 percent rural, with much of the rural population made up of the Hmong, Yao, Lahu, Lisu, Karen, and Akha hill tribes who live in the mountains above the city. 96.6 percent of the district population was of Thai nationality, slightly higher than the national average of 95 percent.

At the provincial level, Chiang Mai hosted a population of 1,649,457 making it the sixth most populated province. A majority of the provincial population lived in or around Chiang Mai district. While most were of Thai nationality, 13.4 percent of provincial residents spoke a hill tribe language other than Thai. 48 percent of the provincial workforce was in the agricultural sector. 29.6 percent of the workforce was self-employed and 23.5 percent participated in unpaid family work, many of which presumably worked in the agricultural sector. 38 percent of the population aged 6-24 years did not attend school. The average years of educational attainment for the population aged 15 and over were 6.6 years.

**Development indicators**: The Human Achievement Indexes (HAI) by provinces in Thailand is shown below. All three potential survey sites rank in the bottom half of Thailand's 76 provinces (1 is highest).

**Figure 4.** Human Achievement Index (HAI) for Thailand's provinces.




***Source:*** United Nations, Human Development Report (2007).

Development indicators are provided by the 2007 United Nations Human Development Report (HDR) for Thailand. The HDR uses the Human Achievement Index (HAI) to assess overall development by province. The index is based on health, education, employment, income, housing and living environment, family and community life, transport and communication, and community participation. Chiang Mai's HAI ranked 63 of Thailand's 76 provinces. The HDR also publishes rankings for each HAI criteria individually. Of note was that Chiang Mai ranked 65th by the health index, 53rd by the employment index, 53rd by the income index, and 14th by the education index. These numbers suggest that, at least at the provincial level, Chiang Mai is lagging behind in development.

**Poultry production**: Recent official poultry data was provided by the Department of Livestock Development (DLD, 2006c) Livestock Survey. In 2006, Chiang Mai province produced a total 3,234,998 chickens. Of those chickens 1,691,824 were of the native variety (53%). A total of 21,568 people were employed in raising poultry and 21,248 of these farmers participated, at least in part, in raising native chickens (98.5%). In 2006, Chiang Mai province also produced 1,075,328 egg-laying hens.

The DLD provides data on native chicken farms with more than 500 chickens. Of these farms, in Chiang Mai, 1074 raised 500-1000 native chickens, 220 raised 1000-2000 native chickens, and 36 raised 2000-5000 native chickens. Collectively there were 1310 large native chicken farms in the province with 971,246 native chickens (57% of provincial native chickens). In 2006, Chiang Mai was home to 13 percent of Thailand's large native chicken farms (DLD, 2006c). These chickens were processed in 41 commercial poultry abattoirs distributed around the province.

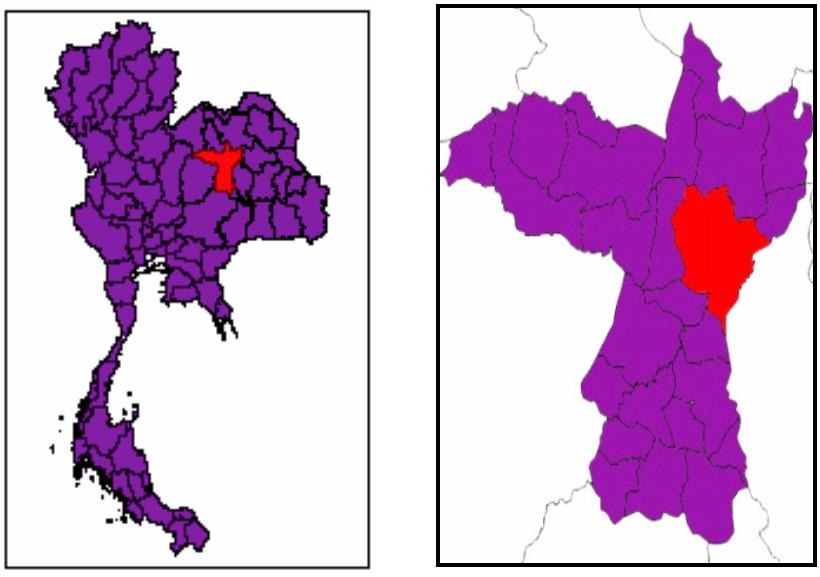
**District poultry markets**: Chiang Mai district is home to approximately 14 markets that operate regularly and sell live / unprocessed poultry. Two markets are reported to operate weekly, three bi-weekly, and nine daily (three of which were reportedly closed on Sundays). A majority of the markets are concentrated in and around the city centre, with six operating east of the centre along the Mae Ping River. Neighbourhoods farther from the centre of town are served by six peripheral markets (three east of the river, two west of the city centre, one directly north of the centre). These extensive market networks mean that Chiang Mai hosts comparatively larger and more numerous live / unprocessed poultry markets than either Khon Kaen or Nakhon Phanom.

**HPAI**: Chiang Mai had four reported outbreaks during the first epidemic wave and one during the second wave, all of which, following control policy, led to mass culling in the area.

### Khon Kaen Background Information

Khon Kaen is similar to Chiang Mai in many respects. Like Chiang Mai in the north, Khon Kaen is a regional centre for the northeast (Isan) region of Thailand. The capital district was also a focus for the national government 1970s regional development programme, and the district hosts the region's largest and most important university: Khon Kaen University (with 20,000 students) which was established in 1964. However, there are important differences between the sites that make Khon Kaen a viable alternative to Chiang Mai. Khon Kaen's location in the northeast immediately differentiates it due to the regions many distinct characteristics.

**Figure 5.** Maps of Khon Kaen province and district.



Khon Kaen Province | Khon Kaen District

Despite the recent economic development and conspicuous metropolitan area in the capital district, the district exhibits rural population majorities. Khon Kaen province is also centrally located making it much less isolated than Chiang Mai in the north. In fact, Khon Kaen is commonly referred to as "the gateway to Isan" due to its regional importance and proximity to Thailand's central region.

**Geography**: Khon Kaen province (changwat) is located 445 kilometres from Bangkok in the north-eastern region of Thailand approximately 300 kilometres west of the border with Laos and 300 kilometres northwest of the border with Cambodia. While conspicuous, the metropolitan area in the capital district makes up only a small portion of this majority rural district. The capital district is bisected by one of Thailand's major highways, the Mithraphap Highway, which connects Bangkok to the northeast and Lao PDR. In addition, the main railway from Bangkok through the northeast runs through this district. Khon Kaen has a climate typical to the northeast with three distinct seasons: cool from November-February, warm from March-May, and rainy from June-October.

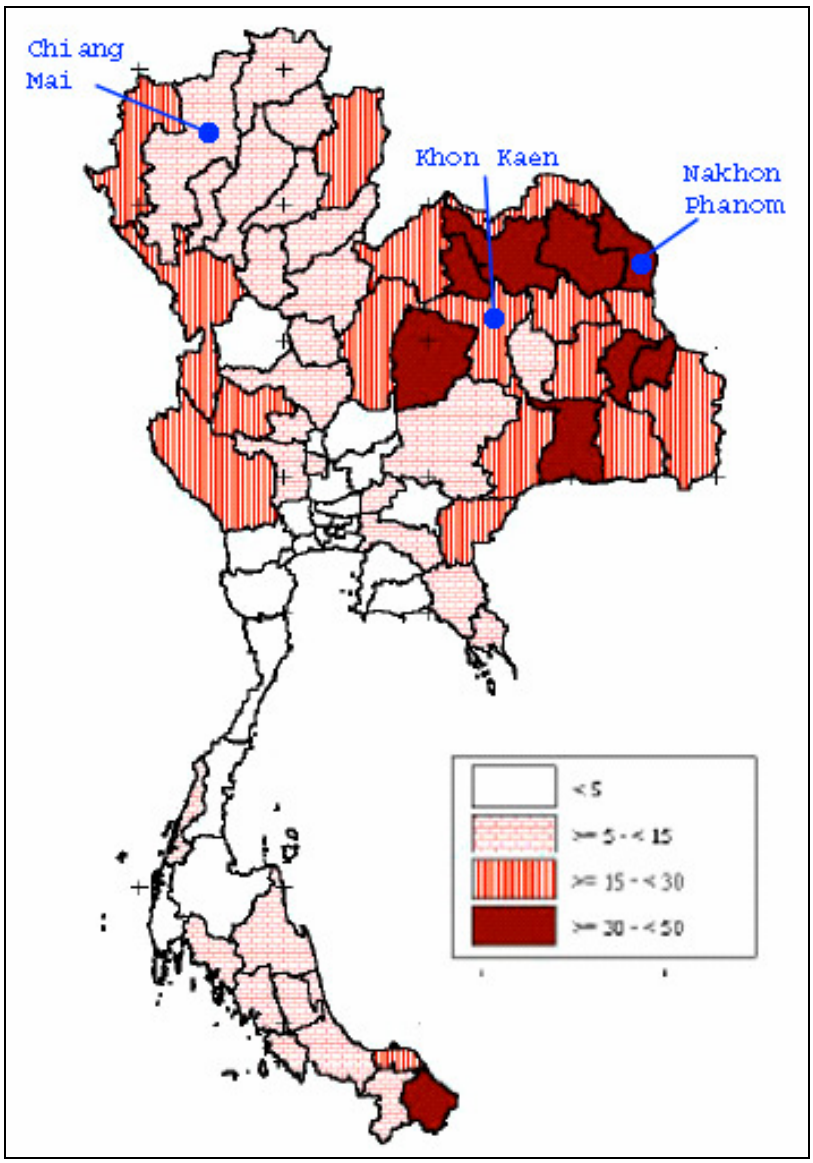
**Population**: Population data is available at the district (amphur) and provincial (changwat) levels from the 2000 National Statistics Office Population and Housing Census.

In 2000, Khon Kaen district had an urban population of 141,202 with a population density of 391.5 inhabitants per square kilometre. Unlike Chiang Mai's mainly urban district, Khon Kaen district population was 39 percent urban and 61 percent rural. 99.8 percent of the district population is of Thai nationality, higher than both Chiang Mai and Nakhon Phanom.

At the provincial level, 70 percent of the Khon Kaen workforce was employed in the agricultural sector compared to only 48 percent in Chiang Mai. 41.8 percent of the workforce was unpaid family workers and 33.7 percent were self-employed. Also, 37.2 percent of the population aged between 6 and 24 were not in school. The average years of educational attainment for the population aged 15 and over were 6.9 years, which is a little bit higher than Chiang Mai.

**Development indicators**: According to the UN - HDR Human Achievement Index (2007); Khon Kaen province ranked 47th in human development, with 16 provinces higher than Chiang Mai. Education ranked 27th, employment ranked 64th, and income ranked 45th. However, the health index ranked 74th, third worst in the entire country. In addition, the World Bank and National Economic and Social Development Board (NESDB) calculated poverty rates in the northeast using the number of people registered for the 2004 Poverty and Registration Program (POREP) and the 2002 Socioeconomic Survey and found that Khon Kaen had poverty headcounts of 10% (POREP) and 19% (Socioeconomic Survey) respectively. Khon Kaen had the fourth highest number of registrations for the POREP in the northeast (19 provinces) [WB and NESDB (2005)].

**Figure 6.** Poverty headcount in Thailand.




***Source:*** Jitsuchon and Richter (2007). (Poverty headcount at the district level calculated using a consumption approach.)

**Poultry production**: At the provincial level, Khon Kaen is a major national producer of native chickens and a mid-level contributor of all chickens. According to the Department of Livestock Development, in 2006 the province raised 2,822,759 total chickens. 2,117,155 of these chickens were of the native variety (75%). A total of 70,960 people were involved in growing chickens of all types and 70,368 of these farmers raised some or all native chickens (99%). In 2006, Khon Kaen province also produced 377,167 egg-laying hens.

Again, information about native chicken farms is limited to farms that raised more than 500 chickens. Of these farms, 100 produced 500-1000 native chickens (65% of large farms), 25 produced 1000-2000 (16%), and 28 produced between 2000-5000 native chickens (18%). Collectively there were 153 large native chicken farms in the province that produced 708,136 native chickens (33%). Presumably the other 67% of native chickens were raised by farmers with less than 500 chickens. Khon Kaen contributed 13% of native chicken produced nationally. To process these chickens there were 65 poultry abattoirs in the province.

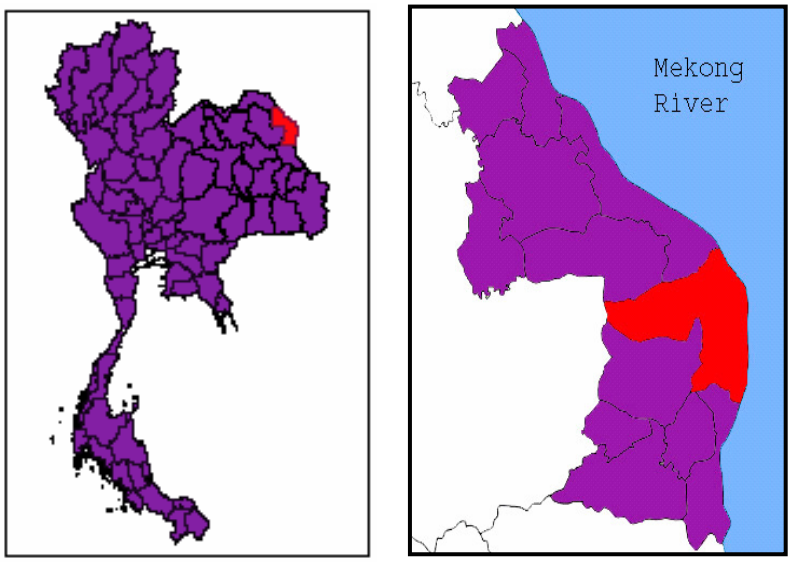
**District poultry markets**: Khon Kaen district hosts approximately five regular markets that sell unprocessed poultry. All of the markets were reported to operate daily. Three reportedly are open all day (two central and the northernmost market), one in the early morning, and the fifth at night. Conflicting accounts were given as to whether they operate Sundays. On the day of the author's investigation, the all-day markets hosted 6, 12, and 24 poultry vendors respectively. The morning market hosted five vendors and the night market only three. Geographically, two all-day markets and the night market are in the centre of the city and presumably serve a wide population. The northernmost market was also open all day and presumably served the more rural population north of highway 209. The southeast market operated only in the morning and presumably served the more rural population south of the city. No vendors or consumers at any of the markets visited by the author reported knowledge of smaller markets outside of town.

**HPAI**: Six outbreaks of HPAI of the H5N1 subtype were reported in Khon Kaen during the first epidemic wave (from January to May 2004) resulting in the mass culling of birds. Moreover, Khon Kaen had one confirmed case of a human infection. The human infection, along with the numbers of reported cases in poultry, makes Khon Kaen the site with the highest incidence of HPAI among the three survey sites.

### Nakhon Phanom Background Information

Like Chiang Mai, Nakhon Phanom province has a national border (with Laos). Khon Kaen and Nakhon Phanom share many characteristics of a north-eastern province (largely rural, chiefly agricultural employment, low income levels). However, few other similarities exist between Nakhon Phanom and the other sites. Nakhon Phanom district has a population approximately one-fifth the size of Khon Kaen. Despite the size, the capital district has characteristics that would make it desirable as a potential survey site. There are significant Lao, Vietnamese, and Chinese influences in the capital. Its proximity to Lao PDR (10 minute boat ride) in concordance with the existence of an airport suggests that it serves as an entrance point for many Laotian goods. Moreover, its size and construction make Nakhon Phanom a much more typical north-eastern district than the more developed Khon Kaen.

**Figure 7.** Maps of Nakhon Phanom province and districts.




Nakhon Phanom Province  Nakhon Phanom District

**Geography**: Nakhon Phanom province is located 735 kilometres from Bangkok in the eastern part of the north-eastern region of Thailand. Its capital district of the same name is situated on the Mekong River directly opposite the Laotian district of Mueng Ta Kaek. Boats run every 30 minutes for most of

the day and traffic between the countries is constant. Nakhon Phanom is connected by major highways on both sides of the Mekong. In Thailand, Highways 22 and 212 connect Nakhon Phanom with the rest of the northeast. On the Laotian side of the Mekong, Mueng Ta Kaek lies on Lao PDRs' main Highway 13 that runs parallel to the Thai-Lao PDR boarder for most of its route from Luang Prabang in the north all the way to the Cambodian boarder in the south. Nakhon Phanom has a climate similar to Khon Kaen with the additional moderation in terms of humidity brought about by the Mekong River.

**Population**: Population data is available at the district (ampur) and provincial (changwat) levels from the 2000 National Statistics Office Population and Housing Census.

In 2000, the district of Nakhon Phanom had a human population of 157,438 resulting in a population density of 185 inhabitants per square kilometre. The district population was 19.6 percent urban and 80.4 percent rural. The urban population was only 31,000. 99.5 percent of the city population is of Thai nationality. However, 0.2 percent of the population spoke either Lao or Vietnamese and as noted, along with the Chinese, these nationalities constitute a significant influence in the district.

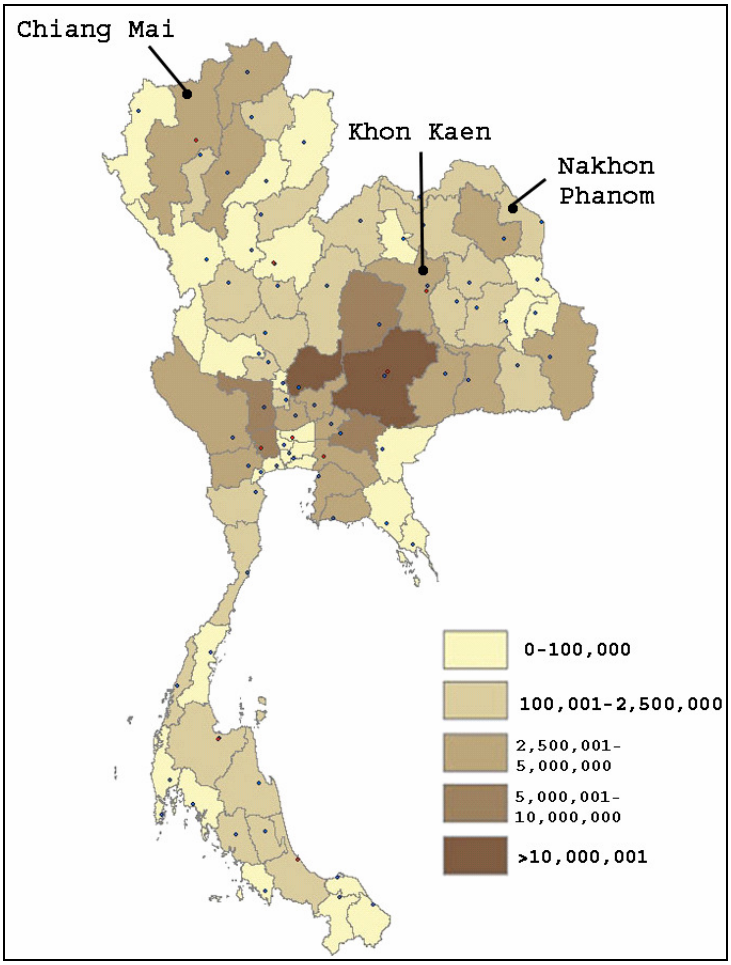
At the provincial level, 82.2 percent of Nakhon Phanom labourers were employed in the agricultural sector. 35.6 percent of the workforce was self-employed and 51.5 percent participated in unpaid family work. 42.4 percent of the population aged between 6 to 24 years were not attending school. The average years of educational attainment for the population over 15 were 6.3 years.

**Development indicators**: According to the United Nations HDR, Nakhon Phanom ranked 69th of 76 provinces in human development. The province ranked 60th in the health index, 69th in education, 34th in employment, and 73rd in income making it the least developed province of the three potential sites. In 2004, 17 percent of the provincial population was registered for POREP, the ninth highest count in the northeast. However, according to the 2002 government socioeconomic household survey, the poverty headcount was 34 percent, the third highest rate found in that survey [WB and NESDB (2005)].

**Poultry production**: In 2006, Nakhon Phanom province was last in chicken production and second in egg production of the three potential sites. According to the Department of Livestock Development, in 2006 the province raised 1,401,440 total chickens. 713,356 of these chickens were of a native variety (42%). A total of 30,778 farmers raised chickens of any type and 30,323 of these farmers raised native chickens (98.5%). In 2006, Nakhon Phanom also produced 650,237 egg-laying hens.

Of the large native chicken farms in 2006, 73 produced 500-1000 native chickens, 5 produced 1000-2000 native chickens, and 7 produced 2000-5000 native chickens. Collectively there were 85 large native chicken farms in the province, producing 44,049 native chickens, constituting only 0.6 percent of national and six percent of provincial native chicken production. Presumably the remaining 94 percent of provincial native chicken production was fulfilled by backyard and smallholder farmers each holding less than 500 chickens. To process these chickens there were 101 poultry abattoirs in the province. This was more than either of the other two provinces despite the fact the Nakhon Phanom raised less chickens. This suggests that like farms, abattoirs in Nakhon Phanom operate on a smaller scale (DLD, 2006c).

**Figure 8.** Chicken production in Thailand by provinces.




**Source:** *Department of Livestock Development (2006 b,c).* The highest densities occur in central Thailand where large scale farms and industrialized chicken production are most common.

**District poultry markets**: To serve the entire population of the capital district there is one large market that operates everyday early morning to late evening. On the date of investigation there were 19 poultry vendors selling unprocessed chicken. However, unlike Chiang Mai and Khon Kaen only one of the poultry vendors was selling eggs. Instead, eggs were available on most streets out of shop storefronts (most commonly magazine shops). The market is centrally located downtown, a short walk from the river and is reportedly a popular market for Laotians as well as Thais.

**HPAI**: Nakhon Phanom experienced one HPAI outbreak in birds in 2006. Government policy at the time dictated culling only the infected flock without pre-emptive culling, due to a policy revision in previous years. This limited experience makes Nakhon Phanom the site least affected by HPAI, although it is also the site with the most recent HPAI outbreak.

### Comparative Overview of Survey Areas

A comparative overview of key indicators of the selected survey provinces, Chiang Mai (CM), Khon Kaen (KK), and Nakhon Phanom (NP) is presented in Tables 1 to 4.

**Table 1.** Human population by province.

| | Population | Urban Population | Rural Population |
|---|---|---|---|
| Province | Total | Total (%) | Total (%) |
| CM | 243,000 | 170,000 (70) | 73,000 (30) |
| KK | 141,000 | 86,000 (61) | 55,000 (39) |
| NP | 157,000 | 31,000 (20) | 126,000 (80) |

***Source:*** National Statistics Office (2000).

**Table 2.** Provincial workforce distributions.

| Province | Agriculture (%) | Self-Employed (%) | Unpaid Family Work (%) |
|---|---|---|---|
| CM | 48 | 29.6 | 23.5 |
| KK | 70 | 33.7 | 41.8 |
| NP | 82 | 35.6 | 51.5 |

***Source:*** National Statistics Office (2000).

**Table 3.** Provincial development indicators (ranks out of 76 Thai provinces).

| Province | Human Achieve-ment Index (Rank) | Health Index (Rank) | Employ-ment Index (Rank) | Income Index (Rank) | Education Index (Rank) | POREP poverty head-count (%) | SES poverty head-count (%) |
|---|---|---|---|---|---|---|---|
| CM | 63 | 65 | 53 | 53 | 14 | n.a. | n.a. |
| KK | 47 | 74 | 64 | 45 | 27 | 10 | 19 |
| NP | 69 | 60 | 34 | 73 | 69 | 17 | 34 |

***Source:*** columns 1-5, United Nations HDR (2007); columns 6 (2004) & 7 (2002), S. Jitsuchon and K. Richter (2007).

**Table 4.** Provincial poultry statistics, 2006.

| Province | Chickens (Total) | Native Chickens (Total; %) | Chicken Farmers (Total) | Farmers with native chicken (Total; %) | Native chickens produced by farms < 500 chickens (%) | Author's estimate of urban poultry markets (Total) | Egg-laying hens (Total) |
|---|---|---|---|---|---|---|---|
| CM | 3,234,998 | 1,691,824; 53 | 21,568 | 21,248; 95.5 | 43 | 14 | 1,075,328 |
| KK | 2,822,759 | 2,117,155; 75 | 70,960 | 70,368; 99.0 | 67 | 5 | 377,167 |
| NP | 1,401,440 | 713,356; 42 | 30,778 | 30,323; 98.5 | 94 | 1 | 650,237 |

***Source:*** DLD (2006).

# Household / Consumer Survey

Household surveys were conducted in the capital district of each province. One third of the sample was made up of households included in the Nations Statistic Office's 2006 Socio-Economic Survey (SES). The other two thirds were made up of our own sample based on the SES sampling method.

**Table 5.** Household sample sizes.

| | Chiang Mai | | Khon Kaen | | Nakon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Expected | Actual | Expected | Actual | Expected | Actual | Expected | Actual |
| Nr of Observations | 507 | 498 | 585 | 582 | *456 | 285 | 1,548 | 1,365 |

*Revised=336.

The actual number of observations approached expected observations in Chiang Mai and Khon Kaen. In Nakhon Phanom, actual observations were much lower because of mislabels in the SES data set. Expected observations were based on the number of observations in the raw SES data. However, upon acquiring the addresses of households it was discovered that close to 40 observations were outside of the capital district, accounting for 120 observations that were not included. Therefore, the revised expected observations for Nakhon Phanom would be 336. The response rates were: Chiang Mai- 72 percent; Khon Kaen-74 percent; and Nakhon Phanom-80 percent.

We were hoping for a response rate of 75 percent, which was achieved in Nakhon Phanom, and was almost achieved in Chiang Mai and Khon Kaen. Non-respondents were replaced with neighbours when possible. Each observation is labelled to define a replacement or an original selection.

## Household Characteristics

Enumerators asked to speak with household members most responsible for grocery shopping. More than 70 percent of respondents were female. Most respondents fell into the middle age groups between 30 and 60 years of age. Chiang Mai had the highest incidence of young respondents with close to a quarter under the age of 30. Chiang Mai is host to at least five universities, more than either of the other provinces.

In every province the most common household size was four people. However, in Chiang Mai respondents were almost equally as likely to reside in households with two or three people. Nakhon Phanom had the highest average household size, followed by Khon Kaen.

Chiang Mai and Khon Kaen respondents reported similar levels of household income. Nakhon Phanom respondents were slightly poorer with more than half of respondents reporting making less than 10,000 baht per month and only 2% of respondents reporting income more than 40,000 baht per month. Almost 70 percent of all households earn between 1 and 20,000 baht per month.

Respondents in Chiang Mai visited the market less often than respondents in other provinces. Almost a quarter of respondents in Nakhon Phanom visited the market more than once per day.

Respondents were asked to report the amount of money spent in one week for the entire household on the following food categories: meats, eggs, poultry, and chicken categories only refer to raw products brought home and cooked. Fried chicken, for example, falls into 'eat out' category even if it was taken home for consumption.

Respondents in Chiang Mai reported the highest average expenditure on eating out, with close to 700 baht per week ($20) while respondents in Khon Kaen reported the highest expenditure on eating in with 880 baht per week ($25). Respondents in Nakhon Phanom spent the least amount of money eating out but the most on poultry meat by roughly 75 baht ($2.15), while Khon Kaen respondents spent the most on all meat by roughly 97 baht ($2.75). However, these averages include households that do not purchase chicken.

The primary reason people do not purchase chicken is that they do not cook at home. (A quarter of respondents in Chiang Mai do not have kitchens. A fifth of respondents in Khon Kaen did not have kitchens and less than a fifth in Nakhon Phanom.) The second most common response, given by one quarter of households, was that they do not like to eat chicken. Less than 2 percent of respondents cited fear of disease as a reason for not buying chicken.

## Purchasing Habits of Chicken-Consuming Households

The following describes weekly food expenditure among households that purchase chickens and excludes households that don't purchase chickens. Chiang Mai and Khon Kaen respondents were the most likely to purchase raw chicken for cooking with 55 percent of total respondents doing so. Slightly less than half of respondents in Nakhon Phanom purchased chicken meat.

Among households that purchase chicken, respondents in Nakhon Phanom spent the most on chicken by 151 baht ($4.25)/week. Respondents in Chiang Mai spent the least on chicken meat by 76 baht ($2.19). Respondents in Khon Kaen spent the most on all meat by 678 baht ($19.50). Respondents who purchased chicken in Nakhon Phanom purchased twice the quantity of respondents in other provinces (2 kg/week vs. 1kg/week).

Interestingly, even though it is the most urban site, respondents in Chiang Mai were most likely to purchase indigenous chicken, accounting for close to a quarter of sales. Respondents in Chiang Mai were also the most likely to purchase cross-breed chicken, although 10% of purchases in Nakhon Phanom were cross-breed chicken.

Broiler chicken was most often sold in parts; however, whole broiler chicken was bought 35 percent of the time in Nakhon Phanom. Indigenous chicken was often purchased as a whole slaughtered bird; yet, in Chiang Mai slightly more respondents reported purchasing indigenous chicken parts. Respondents in Khon Kaen were most likely to purchase live birds, with 14 percent of indigenous chicken purchases occurring with live birds.

Prices in Chiang Mai were highest for indigenous chickens and lowest for broiler chickens. As noted, and despite price differentials, Chiang Mai respondents purchased the most indigenous chickens. Live chickens were usually the cheapest form of meat purchased, followed by whole dead chickens, while parts were the most expensive. Crossbred chickens were more expensive than indigenous chicken in Khon Kaen, but the opposite was true in Nakhon Phanom and Chiang Mai. Overall, indigenous chickens tended to cost approximately 40 percent more per kilogram than broiler chickens. The difference was close to 30 baht (roughly US$1) per kg for each form of chicken.

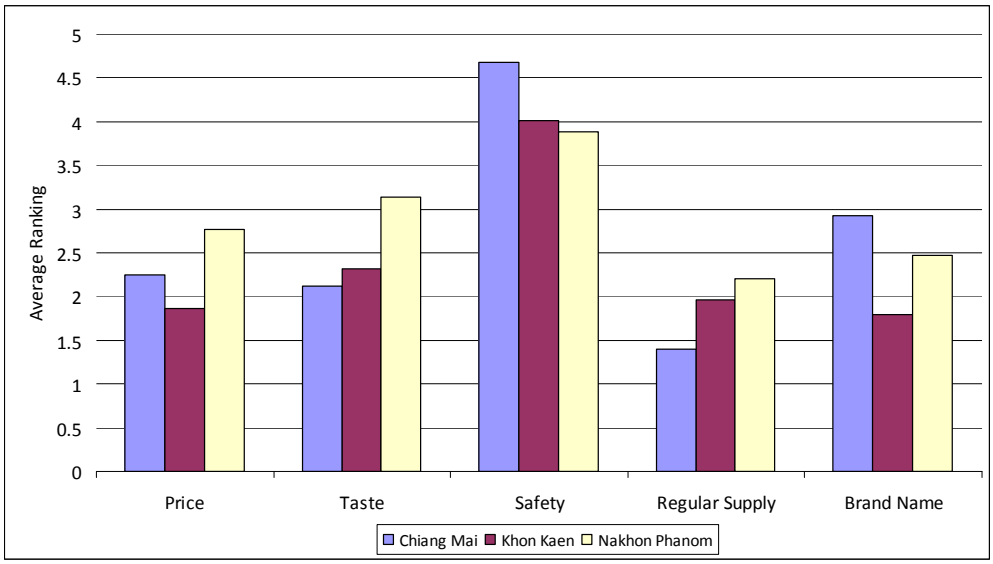
Respondents were asked which breed they preferred the taste of most. A majority of respondents liked indigenous chicken the most, although a third of respondents preferred broiler chicken.

Most grocery shopping occurred at traditional wet markets. In Chiang Mai, however, one quarter of shopping was carried out at supermarkets like Tesco-Lotus. In Nakhon Phanom, one third of shopping occurred at small local shops that were located in storefronts. Respondents in Khon Kaen were most likely to buy directly from a trader or farmer, primarily indigenous chickens.

**Concerns Related to Chicken Meat**

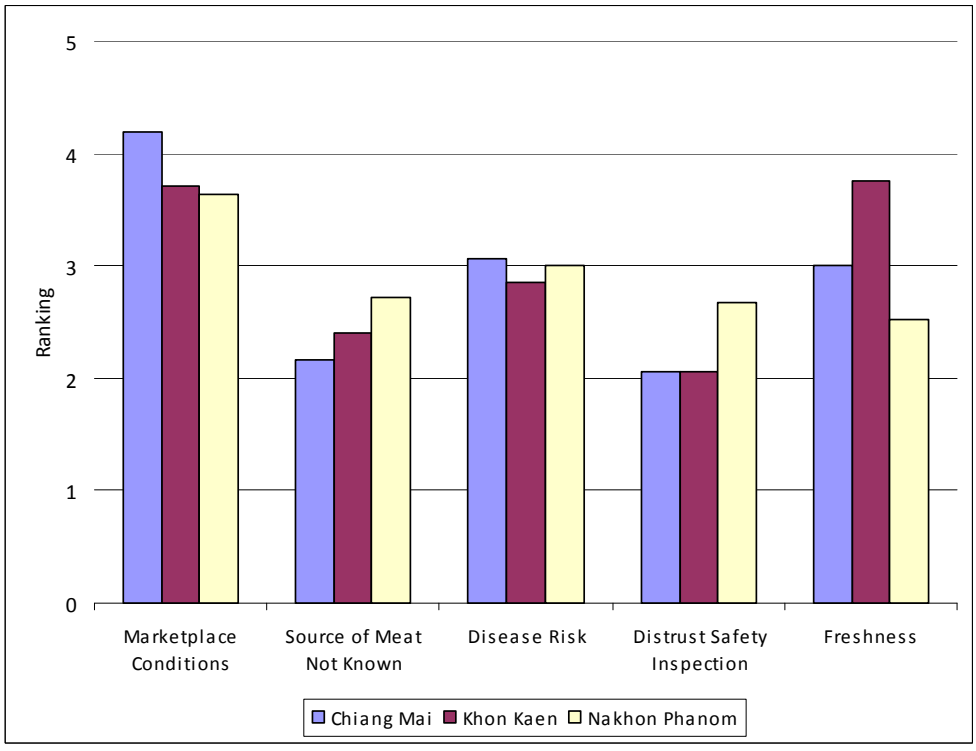
On a scale of 1 to 5 (not important to very important), households were asked to report how important different attributes of chicken meat were to them. Figure 9 shows the results graphically.

**Figure 9.** Concerns expressed by respondents over chicken meat in selected locations.




Safety, as seen above, was the most common attribute sought out in chicken meat. Price and taste were similarly the next sought after attributes, followed by a trusted brand name (which is also related to other product qualities not yet quantifiable). Safety concerns were mentioned by 40.9, 55.3, and 67.6 percent of respondents in Chiang Mai, Khon Kaen and Nakon Phanom respectively (52.3 percent across total sample.) Households who cited safety as a concern were asked why they were concerned about chicken safety. Figure 10 below shows these concerns graphically by location.

**Figure 10.** Average ranking of safety concerns by location.



Unsanitary market conditions were the most common reason reported for worrying about poultry safety. Freshness was the next most common worry expressed followed closely by disease risk (which was larger than freshness in Nakhon Phanom). Unknown source of meat and distrusting safety inspection were both less important, but still relevant. Safety inspections tend to be guaranteed by brands, which seem to be trusted, especially those from known foreign companies.

**Brand Name Chicken Purchasing Habits**

People were asked why they purchase chickens that are produced and labelled by a branded company. Brand name chickens were available for all breed types. Brand name chickens were purchased by 49, 73, and 67 percent of respondents in Chiang Mai, Khon Kaen and Nakon Phanom respectively (63 percent across the total sample.)

Interestingly, respondents in Chiang Mai were the least likely to purchase brand name chickens even though they were the most likely to shop in a supermarket (where all chicken is branded). Almost three quarters of respondents in Khon Kaen reported buying some brand name chicken. Almost all broiler chicken is branded; however, it is less explicit in wet markets because packaging is removed prior to sale, thus affecting safety perceptions.

The overwhelmingly most common reason for purchasing brand name chicken was the safety guarantee. Convenience and packaging were the next most common reasons for purchasing this type of chicken. Price was not a high concern in Chiang Mai or Khon Kaen, while 40 percent cited price and taste each as motivations in Nakhon Phanom.

People were asked the extent of their knowledge about the source of chicken that was not branded. Most respondents who buy chicken that is not branded are unaware of any details of its source.

**Willingness to Pay for Certified Chicken**

Respondents who purchase chickens were introduced to a certification programme that traces chicken back to the farm where it was produced and subjects the farm to regular safety inspections. Households were asked if they were interested in paying extra for such a program.

More than three-quarters of respondents said they would be interested in a certification programme (71, 76, and 85 percent respectively in Chiang Mai, Khon Kaen and Nakhon Phanom).

The following tables break down how much extra money people would be willing to pay by breed. Households interested in the certification system were initially asked if they were willing to pay 30 baht extra. For those who declined, the premium offered was decreased in five baht increments until respondents agreed. People were only asked about breeds they purchase regularly.

While most respondents were interested in paying more for certified chickens, for indigenous chicken 82 percent only wanted to pay 10 baht extra, well below the expected cost of 30 baht ($1.00) for the programme. Similarly, while most respondents were willing to pay 10 baht extra, less than 20 percent were interested in paying 15 baht extra and hardly any were interested in paying 30 baht extra for certified crossbred chickens. Respondents had the highest willingness to pay for certified broiler chickens with 20 percent willing to pay 15 baht extra per kg and 10 percent willing to pay 20 baht extra per kg. However, only two percent of respondents were interested in paying 30 baht extra for certified broiler chicken. It is important to remember that indigenous chickens are already pricier than other types; therefore it seems reasonable that consumers are not willing to pay even more.

**Figure 11a**. Willingness to pay for certified indigenous chicken

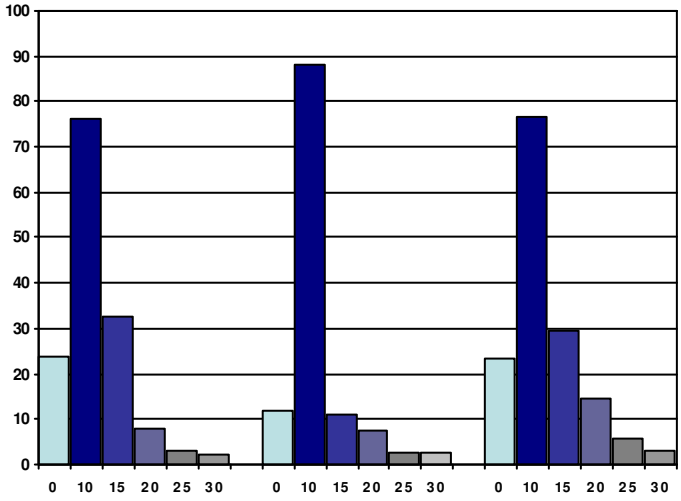



**Figure 11b**. Willingness to pay for certified crossbred chicken

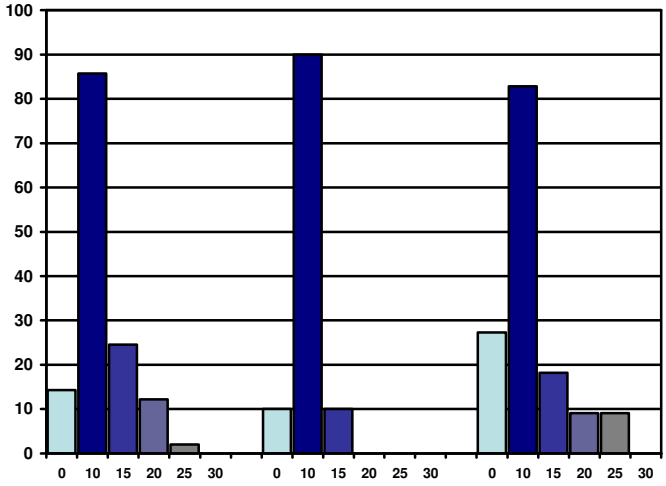
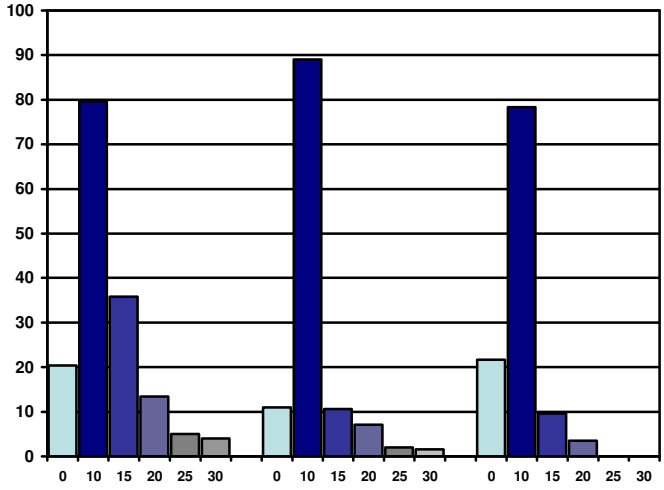



**Figure 11c**. Willingness to pay for certified broiler chicken




From left to right: Chiang Mai, Khon Kaen, and Nakhon Phanom; X-axis = price premium (Baht)

**Why Consumers Are Not Interested in Certified Chicken**

Respondents who were not interested in purchasing certified chickens were asked, specifically, why they are not interested.

In Chiang Mai, respondents were hesitant to agree to pay more because they wanted to know more about the process and required even more detailed information. However, in Nakhon Phanom respondents, they were primarily worried that the system would not work, thus making certification a futile attempt. In Khon Kaen, respondents were worried that the system would not work and were not interested in paying for a system like this.

# Farmer Survey

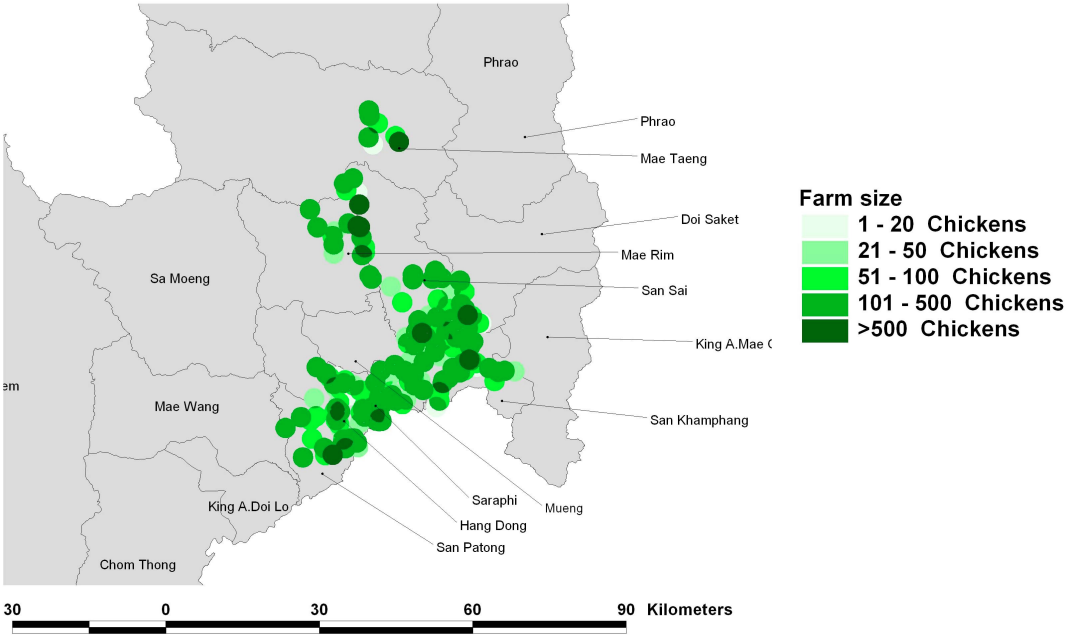
Farmer surveys were conducted in and around the three provincial capitals in the north and northeast. All sites were selected because of high levels of chicken rearing, past experiences with HPAI, and distinct features that differentiated the sites from each other. No frame was available to select poultry farmers from, so enumerators sought out villages and attempted to list the approximate number of farmers in the village. While the resulting sample was not completely random, the large sample size and diverse areas covered lead us to believe that it is representative of the farming populations in the north and northeast regions of Thailand.

**Table 6.** Sample sizes by location.

| | Chiang Mai | | Khon Kaen | | Nakon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Expected | Actual | Expected | Actual | Expected | Actual | Expected | Actual |
| Nr of Observations | 589 | 617 | 600 | 589 | 229 | 401 | 1,425 | 1,607 |

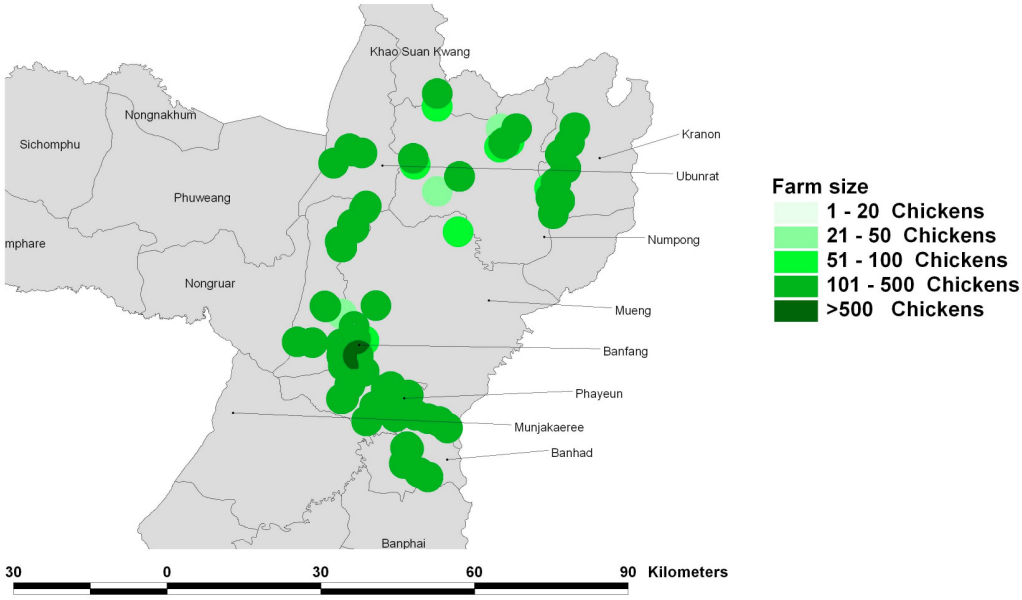
Actual observations were greater than expected in both Chiang Mai and Nakhon Phanom; however, there were 11 less observations in Khon Kaen than expected. Because there were no official lists or registrations of farmers, the expected numbers of observations were known to be very approximate. The higher than expected density of chickens in urban areas led to more observations in Nakhon Phanom while the lower than expected density of chickens in rural areas led to the lesser number of observations in Khon Kaen.

**Figure 12.** Location of farmer observations in Chiang Mai.



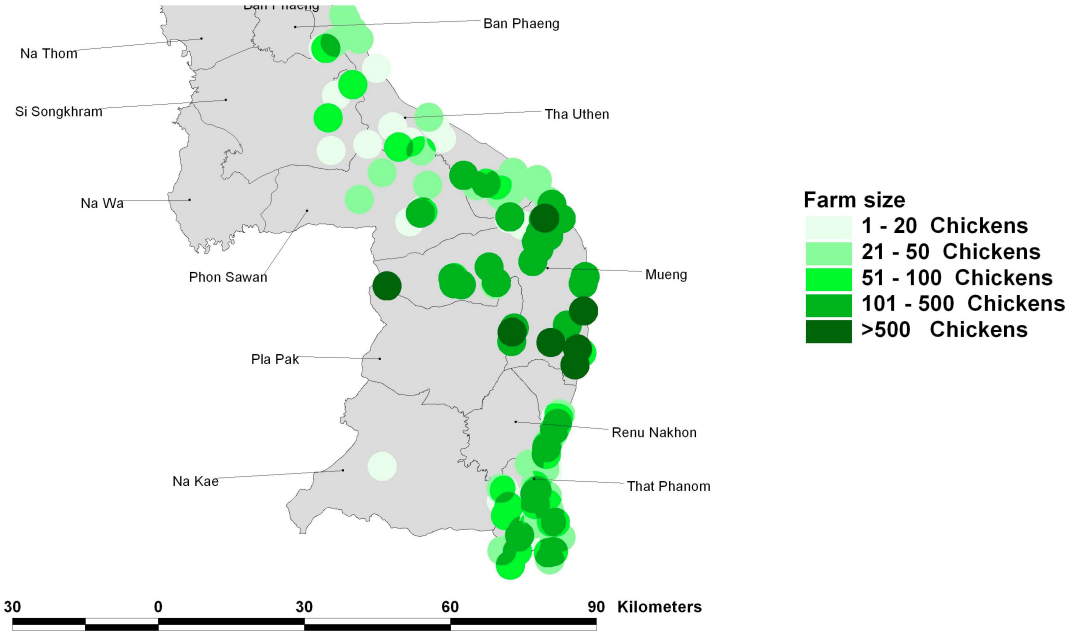

GPS map of farmer observations in Chiang Mai. Mueng Chiang Mai is the capital district. The area east of the capital district is primarily mountainous terrain with few households.

**Figure 13.** Location of farmer observations in Khon Kaen.




GPS map of farmer observations in Khon Kaen. Mueng district is the capital district. The district centre is primarily urban; however, many households in the outer parts of the district raised chicken.

**Figure 14.** Location of farmer observations in Nakhon Phanom.




GPS map of farmer observations in Nakhon Phanom. The Mekong River lies to the east and forms the boarder with Laos. The capital district (Mueng) is largely rural and many residents raise chickens within the district.

Enumerators asked to speak with the person(s) responsible for raising chicken. Most often rearing chickens was a shared responsibility where both male and females were involved in and knowledgeable about the process. Moreover, our enumerators approached households during the daytime in a similar manner that aggregators might approach a household. Consequently, the respondent was often the person who negotiated poultry transactions.

## Farmer Household Characteristics

All provinces had a larger percentage of male respondents, however, in Khon Kaen the proportions of male and female respondents was essentially equal. The primary distinction between the respondents at the three sites was age. Respondents in Chiang Mai tended to be older with more than 45 percent older than 60 years and 90 percent older than 45 years. In contrast, both Khon Kaen and Nakhon Phanom had less than 25 percent of respondents over 60 years, with more than 35 percent of respondents less than 45 years of age.

Household sizes tended to be smaller in Chiang Mai with a mean of 3.3 people, and often consisted of an elderly couple, while households in Khon Kaen were more likely families and averaged 4.7 people, with Nakhon Phanom in the middle averaging 4.1 individuals per household.

Despite the older age of respondents in Chiang Mai, farmers in Chiang Mai and Khon Kaen similarly averaged more than 20 years of work (farming) experience while farmers in Nakhon Phanom averaged closer to 15 years.

More than 80 percent of respondents in each province raised less than 50 chickens. Respondents in Nakhon Phanom tended to have the smallest flocks with more than 50 percent of respondents raising 20 chickens or less with an average of 13 chickens among respondents in this category. The most common range in Chiang Mai was a flock size of 21-50 chickens with 48 percent of respondents falling into this category, averaging 36 chickens. Respondents in Khon Kaen were most likely to raise 20 chickens or less with 48.5 percent of respondents falling into this category.

**Table 7.** Flock sizes in selected locations.

| | Chiang Mai | | | Khon Kaen | | | Nakhon Phanom | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flock Size | Freq | % | Δ | Freq | % | Δ | Freq | % | Δ | Freq | % | Δ |
| Small backyard (<21 chickens) | 202 | 32.7 | 15 | 285 | 48.5 | 16 | 220 | 53.5 | 13 | 707 | 43.7 | 15 |
| Backyard (21-50 chickens) | 297 | 48.0 | 36 | 255 | 43.4 | 36 | 137 | 33.3 | 39 | 689 | 42.6 | 37 |
| Small (51-100 chickens) | 77 | 12.5 | 73 | 42 | 7.1 | 73 | 42 | 10.3 | 77 | 161 | 10.0 | 74 |
| Medium (101-500 chickens) | 41 | 6.6 | 159 | 6 | 1.0 | 183 | 8 | 1.9 | 174 | 55 | 3.4 | 164 |
| Large (>500 chickens) | 1 | 0.2 | 3,000 | 0 | 0 | 0 | 4 | 1.0 | 2,875 | 5 | 0.3 | 2,900 |
| All Farms | 618 | 100 | 47 | 588 | 100 | 31 | 411 | 100 | 59 | 1,617 | 100 | 172 |

Chiang Mai reported the largest share of farms with more than 100 chickens (6.8%), while Nakhon Phanom reported 2.9 percent, and Khon Kaen only registered 1 percent. However, Nakhon Phanom reported the most farms with more than 500 chickens (4 farms) making up 1 percent of all respondents in the province.

## Farmer Motivation for Raising Chickens

In order to better understand the rationales and thinking processes of farmers, they were asked about their motivation for raising chickens, and also some background details to contextualize their decisions under a reasonable working framework that considers their available resources and needs.

**Table 8.** Motivation for raising chickens by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Reason | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Raise primarily for the purpose of sale | 128 | 18.8 | 6 | 1.0 | 4 | 1.0 | 138 | 8.5 |
| Raise for both consumption and sale | 377 | 55.4 | 195 | 33.2 | 170 | 41.4 | 742 | 45.9 |
| Raise primarily for consumption but may be willing to sell if approached by buyer | 110 | 16.2 | 256 | 43.5 | 79 | 19.2 | 444 | 27.5 |
| Raise solely for consumption (will not sell if approached) | 66* | 9.7 | 131 | 22.3 | 158 | 38.4 | 293 | 18.1 |
| All Respondents | 681* | 100 | 588 | 100 | 411 | 100 | 1,617 | 100 |

* In Chiang Mai, farmers who had not sold any chickens in the past five years were not interviewed; only basic information was collected in this location.

One of the major distinctions between rearing practices in the three provinces was the motivation for raising chicken. In Chiang Mai close to one in five households raised chickens for the purpose of sale while less than one in ten reported raising solely for consumption. On the other hand, only one percent of respondents in Khon Kaen and Nakhon Phanom raised chicken for the primary purpose of sale, while one in five, and two in five of respondents in Khon Kaen and Nakhon Phanom, respectively, did not sell any chickens (that is, they raise only for home consumption).

In both Chiang Mai and Nakhon Phanom, respondents were most likely to raise chicken for both consumption and sale, while in Khon Kaen respondents were most likely to raise chicken primarily for consumption, but were willing to sell if they are approached with an attractive offer.

**Table 9.** Background of farmers by motivation of raising chickens.

| | Motivation of chicken raising | | | |
|---|---|---|---|---|
| Variable | Primarily for sales | For consumption and sales | Primarily for consumption but willing to sell | Solely for consumption |
| No. of households | 119 | 631 | 399 | 356 |
| Mean flock size (SD) | 104 (422) | 52 (174) | 29 (22) | 18 (12) |
| % of flock sold | 87.6 | 63.0 | 46.8 | 0 |
| Mean hh income (SD) | 82,926 (267,896) | 50,022 (55,167) | 56,788 (74,351) | 40,733 (34,082) |
| Mean *per capita* hh income (SD) | 19,126 (17,793) | 13,389 (12,549) | 13,925 (21,203) | 10,536 (10,615) |
| Mean hh cash income from chicken (SD) | 25,713 (26,540) | 1,471 (1,530) | 706 (772) | 0 (-) |

Households raising chickens primarily for sale were the wealthiest respondents while respondents raising chickens only for consumption had the lowest levels of income. Interestingly, households raising chickens for both consumption and sale had lower household incomes than those raising primarily for consumption but willing to sell. However, *per capita* household incomes were similar between the two groups. The average income from selling chicken was 700 Baht ($20) per year for

those who raise chickens for consumption but also sell, and 1,400 baht ($40) per year for those who raise chickens for both sale and consumption.

## Farmer Income From Raising Chicken

Respondents were asked to report their income from raising chicken, crops, other wages from other jobs (or activities), and any other investments they maintained. Our question excluded transfers from family members out of simplicity because many elderly respondents reported receiving regular monetary or food support from their children.

**Table 10.** Sample income (Baht / %) statistics by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Variable | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Household income 2007 (Baht) | 64,556 | 143,911 | 51,281 | 56,241 | 38,192 | 24,922 | 53,030 | 96,589 |
| HH income from chicken[1] 2007 (Baht) | 6,435 | 125,471 | 754 | 974 | 1,298 | 3,278 | 3,064 | 77,596 |
| HH income from chicken[1] 2005, 2003[2] (Baht) | 1,332 | 5,211 | 691 | 905 | 1,025 | 1,829 | 1,021 | 3,406 |
| Income from chicken[1] 2007 (%) | 5.9 | 13.6 | 2.1 | 2.8 | 3.7 | 7.1 | 4.0 | 9.5 |
| Income from chicken[1] 2005, 2003[2] (%) | 4.1 | 10.3 | 2.0 | 2.7 | 3.1 | 7.7 | 3.1 | 7.7 |
| Observations | 618 | | 588 | | 410 | | 1,616 | |

[1] Excluding fighting cock

[2] Because of the dates of the respective outbreaks in each province, respondents in Chiang Mai were asked about their income in 2005 and respondents in Khon Kaen and Nakhon Phanom were asked about their incomes in 2003

The levels of income were dramatically different between the three provinces with Chiang Mai reporting annual household incomes of close to 65,000 Baht (~$2,000) while respondents in Nakhon Phanom reported an average annual household income of 38,000 Baht (~$1,150). Khon Kaen was in the middle reporting 51,000 Baht per year (~$1,500). Per capita household income was also highest in Chiang Mai. However, it was more similar in Khon Kaen and Nakhon Phanom (11,900 and 10,800 Baht respectively). Respondents in every province have increased the amount and percentage of income from rearing chicken before and after the Avian Influenza outbreaks.

The following table provides background information of farmers' behaviours and income from poultry by province. Respondents in Chiang Mai had the highest average incomes for each category. Interestingly, in both Chiang Mai and Khon Kaen, average incomes were higher among those who raised chickens for consumption but sold some chickens, than they were for respondents who raised chickens for both sale and consumption simultaneously.

Khon Kaen was the province where respondents raising chickens for consumption, whilst also willing to sell, had the highest average household income. Farm sizes among those respondents who raise chickens primarily for sale were much smaller than respondents in the same category in other provinces. The reason for this is that Khon Kaen did not have any large farms with more than 500 chickens and had only 6 respondents with at least 100 chickens.

**Table 11.** Background of farmers by motivation of raising chickens and by Province.

| | Motivation of chicken raising | | | |
|---|---|---|---|---|
| Variable | Primarily for sales | For consumption and sales | Primarily for consumption but willing to sell | Solely for consumption |
| ***Chiang Mai*** | | | | |
| No. of households | 128 | 377 | 110 | 66 |
| Mean flock size (SD) | 77 (266) | 43 (37) | 24 (16) | 17(6) |
| % of flock sold | 87.1 | 67.1 | 43.3 | 0 |
| Mean hh income (SD) | 86,607 (277,858) | 57,094 (70,431) | 65,305 (96,720) | 49,000 (35,320) |
| Mean hh income from chicken (SD) | 27,050 (275,567) | 1,220 (1,353) | 494 (473) | 0 |
| ***Khon Kaen*** | | | | |
| No. of households | 6 | 195 | 255 | 132 |
| Mean flock size (SD) | 19 (20) | 35 (25) | 33 (25) | 20 (11) |
| % of flock sold | 98.3 | 51.8 | 43.2 | 0 |
| Mean hh income (SD) | 32,667 (22,509) | 44,369 (35,494) | 58,740 (73,009) | 47,795 (41,173) |
| Mean hh income from chicken (SD) | 1,467 (1,219) | 1,249 (1,163) | 747 ( 797) | 0 |
| ***Nakhon Phanom*** | | | | |
| No. of households | 4 | 170 | 79 | 158 |
| Mean flock size (SD) | 1,090 (1,941) | 92 (356) | 23 (13) | 17 (13) |
| % of flock sold | 87.5 | 66.8 | 64.4 | 0 |
| Mean hh income (SD) | 40,500 (13,304) | 40,824 (25,060) | 38,608 (22,790) | 35,095 (25,831) |
| Mean hh income from chicken (SD) | 19,350 (27,190) | 2,279 (1,947) | 867 ( 954) | 0 |

Respondents in Nakhon Phanom tended to receive larger incomes from selling chicken when they sold a portion of their remaining flock (after satisfying family needs). For example, respondents raising chickens for consumption and sale made more than 1,000 baht from chicken over what similar respondents made in Khon Kaen or Chiang Mai. In addition, respondents who considered consumption their main goal, but were willing to sell some chickens, sold an average of 65 percent of their flock. This was about 20 percent greater than in the other provinces and much closer to respondents who said they raise chickens for consumption and sale.

Cash outlays for raising a small number of indigenous chickens are very low. Nearly every respondent supported poultry rearing with personal savings either from poultry raising or savings from another job. The next most common source of financing was income from a currently held job with up to 96 percent of respondents in Khon Kaen falling into this category. Only a few large farms had taken out bank loans and nobody reported borrowing money from family or friends to finance chicken rearing.

Negligible numbers of respondents in Chiang Mai and Khon Kaen were registered with the DLD (1.0 and 0.2 percent respectively). However, the DLD was much more active with smallholders in Nakhon Phanom and more than 20 percent of respondents were registered. Farmer networks were also most common in Nakhon Phanom (15.3% respondents). Many previously existing networks that we contacted in Chiang Mai and Khon Kaen had disbanded after the avian influenza outbreaks occurred.

Every respondent, except for a few layer farmers in Nakhon Phanom raised at least some indigenous chickens. Altogether, only one respondent raised crossbred chickens and only three respondents raised broiler chickens.

Fighting cocks were fairly common in Chiang Mai and Nakhon Phanom with roughly one in four households raising some fighting birds in each province. In Khon Kaen only eight percent of respondents raised fighting cocks. The overall average number of fighting cocks raised was 6.5; however, it was lowest in Chiang Mai (where fighting cocks were most common).

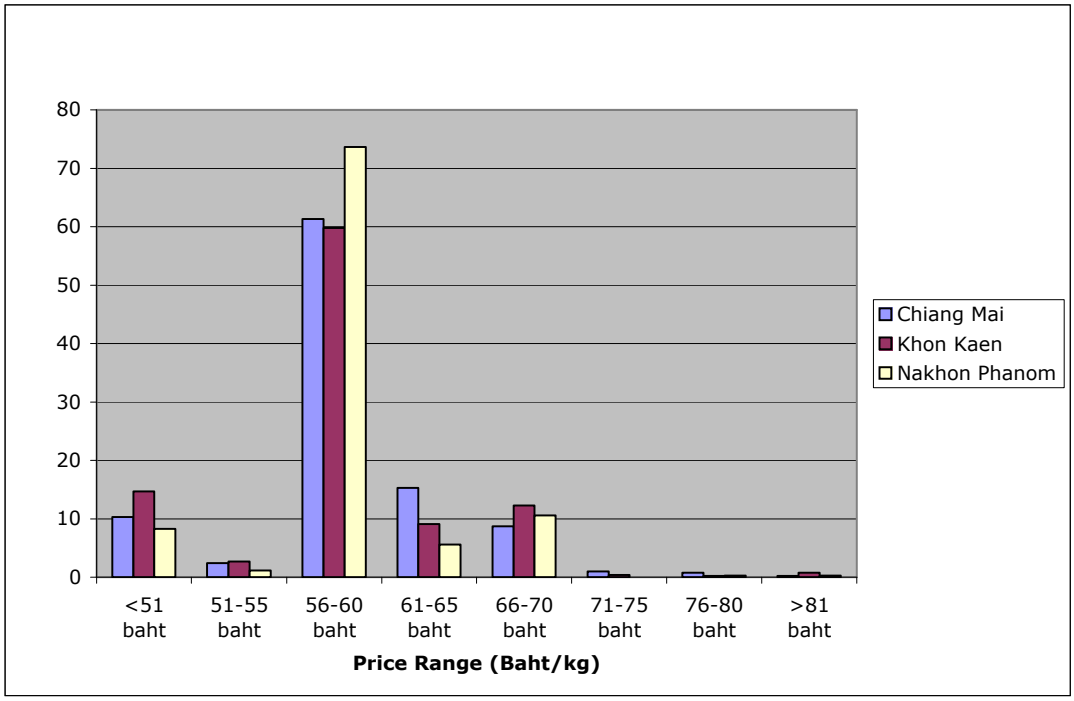
In extreme cases, in both Khon Kaen and Nakhon Phanom, some households reported raising up to 50 fighting cocks. Households that raised only fighting cocks were not included in the sample. Most households with more than a few fighting cocks raise them for sale to other 'trainers'.

There was minimal trade of chicks reported in any of the provinces. Most respondents source chicks from hens on their own farm (more than 98% overall). Less than one percent of farmers in Chiang Mai and Khon Kaen buy any chicks. In Nakhon Phanom this number was higher, though still only 5.2 percent of respondents sourced chicks from other farms.

Most farmers did not sell eggs. Very little money is to be made from few egg sales. Indigenous chicken eggs are considered to have inferior taste to chicken eggs produced commercially. This contributes to the high incidence of farmers using hens on their farm for restocking their flocks rather than egg production for home consumption. Some respondents reported household consumption of indigenous chicken eggs; however, information on this activity was not collected.

Interestingly, the farm gate price for indigenous chicken was very similar in every province with a range of approximately two baht between Chiang Mai (the most expensive) and Nakhon Phanom (the least expensive). There was some range among respondents based largely on the buyer (i.e. aggregator, vendor, or end user) and the state of the chicken (slaughtering a bird adds a premium of 15-20 baht).

**Figure 15.** Price distribution of indigenous chickens sold in 6 month period (Baht/kg).




Farmers in Chiang Mai were most likely to sell to aggregators with more than 50 percent of respondents selling at least some chickens to them. In Khon Kaen more than 95 percent of

respondents sold some chickens to end users (usually neighbours). End users were the most common buyers in Nakhon Phanom; however, market vendors purchased the highest volume of chicken.

**Table 12.** Volume of sales and marketing channel used (count and percent).

| Buyer | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Total sales (birds/year) | 1,341,800 | 548,400 | 697,700 | 2,587,900 |
| Aggregator | 41.5 | 8.5 | 5.2 | 24.7 |
| Market vendor | 41.4 | 5.5 | 52.5 | 36.8 |
| End user | 16.8 | 86.0 | 42.3 | 38.3 |
| Slaughterhouse | 0 | 0 | 0 | 0 |

While end users were common chicken buyers in all provinces, they tended to buy small volumes of chickens. When adjusted for volume of sales, vendors purchased more chickens than end users in Nakhon Phanom. Also, in Chiang Mai vendors purchased larger volumes of chicken than aggregators.

Farmers were asked whether they had any pre-existing agreements with people that they sold chickens to. Vendors were most likely to have verbal agreements with farmers, followed by aggregators. Most end users did not have any type of agreements (formal or informal).

Respondents in all provinces with verbal agreements tended to have stipulations for time, price and quantity of purchase. Farmers did not report offering any type of discounts to buyers for regular purchases.

Farmers were asked how many different people they had sold chickens to in the past year. Farmers in Khon Kaen had the largest number of distinct buyers followed by Nakhon Phanom. This question is inversely related to the volume of chicken sold to each buyer. Khon Kaen had the highest number of buyers because they were mostly end users who purchase small volumes of chicken.

Few respondents sold eggs; however, those respondents keeping layers generally received significant percentages of income from eggs. Ducks were commonly raised in every province with the highest occurrence in Khon Kaen where close to 20 percent of respondents kept flocks of ducks which made up an average of 30 percent of the total poultry flock (when part of the flock). Poultry farmers very rarely participated in other activities related to poultry trade.

## HPAI Culling Experience, Sanitary Measures, and Inspections

Culling was most widely experienced in Chiang Mai with close to 10 percent of respondents reporting past culling. Slightly less than 5 percent of respondents in Khon Kaen and Nakhon Phanom had experienced culling of their flock (which may reflect lower disease burdens).

**Table 13.** Number of farmers whose poultry were culled.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Flock culled | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Yes | 63 | 9.6 | 29 | 4.9 | 18 | 4.4 | 93 | 6.2 |

In Khon Kaen and Nakhon Phanom, similar levels of compensation were reported, averaging about 45 baht per bird culled. However, percentages of total flock culled were drastically different. Most respondents in Khon Kaen reported having 100 percent of their flock culled while many of the respondents in Nakhon Phanom reported having less than 10 percent of their total flock culled. Birds that were not culled tended to be hidden on the farm or temporarily moved to another location. Under-reporting may have occurred as many infected birds were not detected or reported.

Respondents in Chiang Mai were not asked about the details of their culling experiences because the questions proved contentious during pilot surveys. Informal discussions revealed that it was not uncommon for farmers to hide their chickens from culling by the authorities.

Enumeration in Chiang Mai took place during an outbreak and it is possible that respondents did not want to provide any incentive for authorities to search for hidden birds by admitting to having hidden birds in the past.

**Table 14.** Details of culling experience.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| No. of birds culled | - | - | 26.0 | 15.2 | 33 | 94.3 | 30 | 73.0 |
| % of flock culled | - | - | 93.8 | 14.3 | 8.3 | 15.8 | 42.5 | 45.1 |
| Compensation / culled bird (Baht) | - | - | 44.5 | 31.1 | 45.2 | 43.7 | 44.7 | 96.2 |
| Total compen-sation (Baht) | - | - | 570 | 1,127 | 670 | 1,307 | 630 | 1,220 |

In Chiang Mai, the reported culling took place in one area. Ampur Hang Dong, Sarapee, and San Kampang are within close proximity of each other. HPAI cases were reported in San Kampang in 2004, 2006, and 2007.

In San Kampang, almost half of respondents reported that their birds have been culled. Within villages surrounding possible HPAI cases, nearly 100 percent of respondents had their birds culled. Culling in Khon Kaen was concentrated in two villages. Village 9 was the village where the DLD reported finding a positive HPAI bird. Culling in Nakhon Phanom took place in three villages. The DLD reported finding positive tests of HPAI on layer farms in village 5. Villages 1 and 3 border the site of positive tests.

Respondents in Khon Kaen were most likely to have decreased their flock size since experiencing culling. In Nakhon Phanom, however, a majority of respondents' flock size had not changed and in fact more than 40 percent of respondents had increased their flock size since culling.

Medicine and vaccines were the most common forms of applied animal health measures. Close to half of respondents in Chiang Mai used medicines. In Nakhon Phanom, more than 40 percent of respondents used vaccines. Slightly less than a third of respondents in Chiang Mai, and half of respondents in Khon Kaen, kept their chickens in an enclosed area which they regularly cleaned. Farmers in Khon Kaen were the least likely to use bio-security measures.

**Table 15.** Sanitary measures adopted by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Measure | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Medicine | 306 | 46.7 | 134 | 30.3 | 80 | 19.5 | 520 | 34.4 |
| Vaccines | 223 | 34.0 | 115 | 26.0 | 177 | 43.1 | 515 | 34.1 |
| Hold chickens in an enclosure | 206 | 31.4 | 84 | 19.0 | 185 | 45.0 | 475 | 31.5 |
| Chicken holding facility located away from the home | 5 | 0.8 | 2 | 0.5 | 11 | 2.7 | 18 | 1.2 |
| Closed housing system | 1 | 0.2 | 0 | 0 | 0 | 0 | 1 | 0.1 |
| Other precautions | 5 | 0.8 | 0 | 0 | 61 | 14.9 | 66 | 4.4 |

More than four in five respondents in Chiang Mai and Nakhon Phanom reported having been inspected at some time during the past five years. Most inspections take place from local village or district organizations. However, one third of respondents in Nakhon Phanom had been inspected by the DLD. Less than half of Khon Kaen respondents had been inspected in the past five years.

## Poultry Farmer Concerns

Farmers were asked which issues facing smallholders concerned them most. Respondents were asked to rate their level of concern for each issue on a scale of zero to three with zero meaning the respondent does not worry at all and three meaning respondent worries about this issue every day.

**Table 16.** Ranking of poultry farmers' concerns (percent of respondents).

| Rank | Low Demand | HPAI | Government culling | Lack of capital | Other disease | Other |
|---|---|---|---|---|---|---|
| 0 | 97.0 | 63.8 | 75.9 | 77.8 | 74.4 | 77.5 |
| 1 | 2.5 | 10.9 | 6.8 | 11.9 | 15.7 | 8.5 |
| 2 | 0.3 | 11.1 | 7.2 | 7.6 | 7.7 | 9.9 |
| 3 | 0.2 | 14.3 | 10.1 | 2.8 | 2.2 | 4.1 |

The most common worry was that the farmers' flock would contract HPAI with one in four respondents saying they were either somewhat or very concerned. The next most common concern was that the government would cull the farmers' flock. However, less than one in five respondents reported being somewhat or very concerned while three in four people reported not being concerned at all about the possibility of culling.

Farmers in Chiang Mai tended to be more worried than farmers in other provinces. More than 40 percent of respondents were somewhat or very concerned about HPAI and more than 30 percent were concerned about the possibility of government culling.

Less than 5 percent of respondents in Khon Kaen were somewhat or very concerned about HPAI or related culling. Almost one in five respondents in Nakhon Phanom were somewhat or very worried about HPAI; however, less than one in ten was worried about culling.

# Aggregator Survey

Expected numbers of traders were based on the number of estimated farmers and total population in each province. Consequently, these expectations were meant to be general approximations of the actual numbers.

**Table 17.** Sample of aggregators in selected locations.

| | Chiang Mai | | Khon Kaen | | Nakon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Expected | Actual | Expected | Actual | Expected | Actual | Expected | Actual |
| Nr of Observations | 27 | 25 | 34 | 10 | 14 | 9 | 75 | 44 |

In Chiang Mai and Nakhon Phanom the actual number of observations approached the expected numbers. However, in Khon Kaen the actual observations were much less than expected. The reason for the lower number of observations in Khon Kaen was that farmers were much more likely to sell directly to end users, and aggregators/traders in Khon Kaen played only a limited role in provincial poultry trade.

There were minimal problems with non-responses; however, it was difficult to locate aggregators because they are, by the nature of their jobs, extremely mobile. Without any official registration, most aggregators had to be located at their homes or tracked down through phone numbers provided by farmers.

## Aggregator Household Characteristics

Aggregators in Chiang Mai were primarily male, while a majority of respondents in other provinces were female. Aggregators in Chiang Mai tended to be older and have an average of six more years experience than respondents in other provinces. Respondents in Nakhon Phanom were notably younger with more than three-quarters of respondents under the age of 45 compared to four percent of Chiang Mai respondents and twenty percent of Khon Kaen respondents.

In Khon Kaen, aggregators were more likely to use a car than a motorbike to trade chickens (owing to distances travelled to reach markets). However, in Nakhon Phanom aggregators were more likely to use motorbikes. Only one respondent, an aggregator in Nakhon Phanom with two motorbikes, reported using more than one vehicle for trading.

## Poultry Income and Trade Patterns of Aggregator Households

Respondents in all three provinces received similar percentages of income from trading which ranged, on average, between 75 and 78 percent of total income. Monthly income information was unavailable for aggregators in Khon Kaen and Nakhon Phanom.

**Table 18.** Proportion of monthly household income of aggregators from poultry by location (percent)

| | Chiang Mai | | | | Khon Kaen | | | | Nakhon Phanom | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Min | Max | Mean | SD | Min | Max | Mean | SD | Min | Max |
| Household income from poultry trade | 78 | 91 | 8 | 100 | 78 | 91 | 8 | 100 | 75 | 24 | 30 | 100 |

Respondents in all three provinces traded between 200 and 250 chickens per month. All respondents purchased from farms much more often than from traders. Respondents in Chiang Mai tended to buy fewer birds from more farmers while respondents in Nakhon Phanom and Khon Kaen purchased

larger quantities from fewer sources to average higher monthly trading volumes. Indigenous chicken dominated trade in Chiang Mai and Khon Kaen with every respondent trading at least some indigenous chicken. However, in Nakhon Phanom, one-third of respondents traded primarily broiler chickens from other provinces. In Chiang Mai and Khon Kaen this role was filled not by independent traders but by deliverymen working for large broiler farms.

Traders were more locally centred in Chiang Mai with 75 percent of purchases coming from within the district where the trader was based. While there was a negligible amount of chickens sourced from other provinces in Chiang Mai and Khon Kaen, more than one-fifth of chickens were purchased from other provinces in Nakhon Phanom. Most of the purchases from other provinces were broiler chickens. Nakhon Phanom is, comparatively, the smallest province geographically.

Similarly to chicken purchases, chicken sales were most localized in Chiang Mai with 64 percent of sales within the same district and 90 percent within the same city. Aggregators in Khon Kaen were the only respondents who sold chickens in other provinces with 40 percent of sales made in neighbouring provinces. Inter-provincial trade of poultry without certification is illegal in Thailand.

Certification of chicken was not observed in Chiang Mai or Khon Kaen. However, many aggregators in Nakhon Phanom reported trading certified chicken, largely made up of by inter-provincial broiler trade. Most birds were purchased live, slaughtered by aggregators, and sold as whole carcasses or parts. However, aggregators in Khon Kaen and Chiang Mai reported some sales of live birds (22 and 30% respectively). Sale of live birds is most often made to market vendors who slaughter the birds before bringing them to market. More than one in four respondents held chickens an average of two or more nights before selling. The majority of aggregators in Chiang Mai and Khon Kaen slaughtered chickens themselves with some help from family members not involved in other aspects of trading. In Nakhon Phanom 60 percent of slaughter was carried out by aggregators and family members with 33.3 percent carried out by paid third parties (again for broilers).

The average price that aggregators purchased indigenous chickens for is close to 60 Baht (US$1.75). However, aggregators who purchased slaughtered chickens reported higher average prices. This is the most verifiable explanation for most responses above 80 Baht.

**Figure 16.** Average purchase prices for indigenous breeds by location.

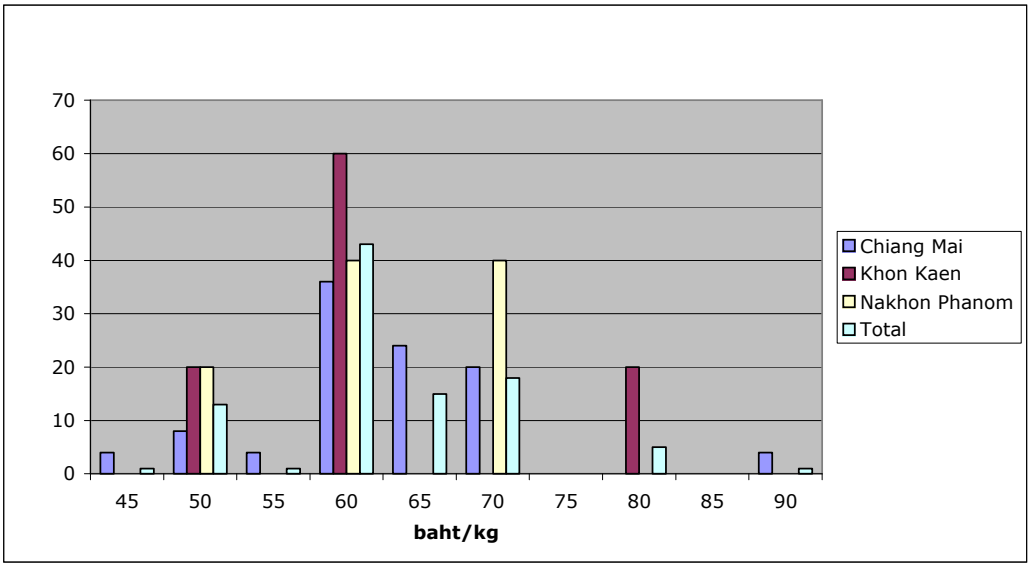
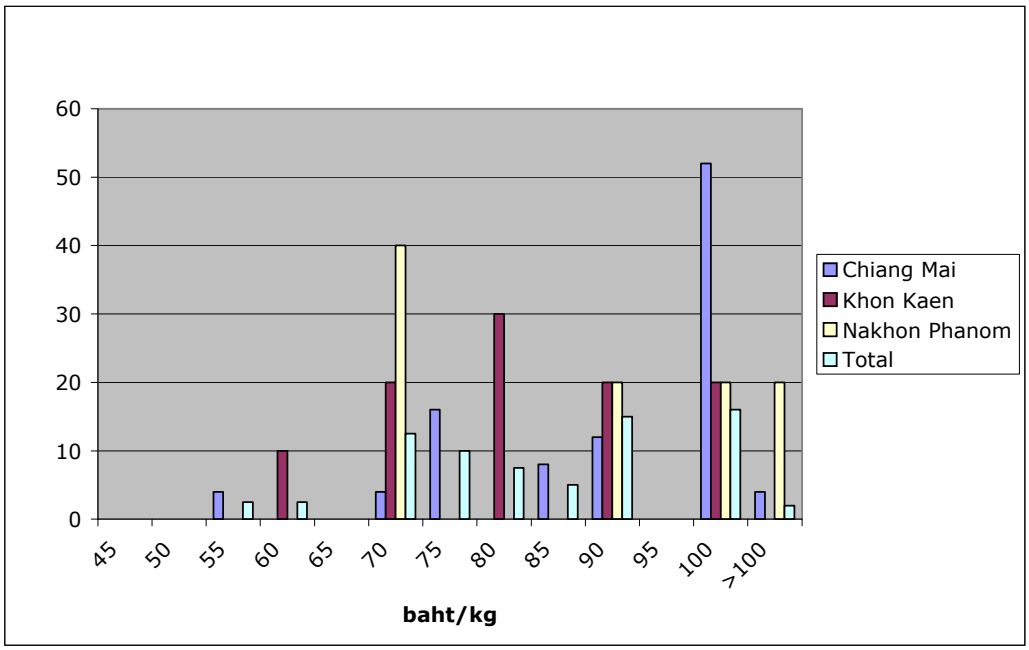


**Figure 17.** Average selling price for indigenous breeds by location.




Aggregators in Chiang Mai and Nakhon Phanom reported similar price increases of about 25 Baht per kilogram of chicken. Khon Kaen vendors reported both lower purchase prices and lower sale prices, in fact, price mark-ups in Khon Kaen where 4.5 - 6.5 baht less than in other provinces.

A large majority of aggregators purchase chicken from farmers; however, there is a limited amount of trade between aggregators in each province. Most chickens traded were purchased from backyard farms. The exception was broiler chickens purchased from other provinces by aggregators in Nakhon Phanom. Khon Kaen had the largest volume of trade between aggregators making up 20 percent of total purchases.

**Table 19.** Size of farms where chicken is purchased.

| Source | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Backyard Farm (<50 Chickens) | 82.4 | 80.0 | 66.7 | 78.9 |
| Small Farms (51-100 Chickens) | 5.2 | 0 | 0 | 3.0 |
| Medium Farms (101-500 Chickens) | 0.8 | 0 | 0 | 0.5 |
| Large Farms (>500 Chickens) | 5.2 | 0 | 33.3 | 9.2 |
| Bought From Other Traders | 6.4 | 20.0 | 0 | 8.4 |

There was a distinction between the role of aggregators in Chiang Mai and their roles in Khon Kaen and Nakhon Phanom. Chiang Mai aggregators reported selling more than three-quarters of chickens to end users. However, Khon Kaen and Nakhon Phanom aggregators sold primarily to restaurants and shops with 55 percent and 79 percent of total sales respectively. Market vendors accounted for 15-20 percent of sales in each province.

**Table 20.** Source of sale by location (Percent).

| Sale Source | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Market Vendor | 18.4 | 20.0 | 16.7 | 18.4 |
| End User | 76.4 | 10.0 | 0 | 45.7 |
| Restaurants/Shops | 1.2 | 55.0 | 78.9 | 29.3 |
| Slaughterhouse | 4.0 | 5.0 | 0 | 3.4 |
| Another Trader | 0 | 10.0 | 0 | 3.2 |

Respondents were asked if they had any pre-existing agreements with the people they traded with. While formal contracts were not reported by aggregators, about 60 percent of aggregators in Chiang Mai and Khon Kaen reported having verbal agreements with farmers, while 43 percent of aggregators in Nakhon Phanom reported having such agreements. Aggregators in Khon Kaen were the least likely to have any type of agreement when selling their chickens.

Most aggregators in every province had verbal agreements with market vendors. Restaurants and shops were likely to have verbal agreements in Chiang Mai and Nakhon Phanom with 75 and 50 percent of sale respectively. Khon Kaen aggregators did not report any type of agreement with restaurants and shops. Aggregators had some verbal agreements with end users in Chiang Mai and Nakhon Phanom, and none in Khon Kaen.

Aggregators were asked what verbal agreements stipulated in their sale. Most respondents reported reaching prior agreements about the time, price, and quantity of purchase. In addition, 30 percent of aggregators in Chiang Mai reported offering lower prices to buyers with whom they had verbal agreements.

## Sanitary Measures and Inspections

Aggregators in Nakhon Phanom, like farmers, were by far the most likely to provide vaccine or medicine to chickens they were holding with more than three in four aggregators using medicine. In addition, most aggregators in Nakhon Phanom cleaned their holding facilities regularly and a third had a closed housing system.

**Table 21.** Sanitary measures taken by aggregators.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Measure | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Clean chicken holding facility between batches | 10 | 25 | 3 | 30 | 7 | 78 | 20 | 46 |
| Medicine | 4 | 16 | 1 | 10 | 7 | 78 | 12 | 27 |
| Vaccines | 3 | 12 | 1 | 10 | 5 | 56 | 9 | 21 |
| Closed housing system | 0 | 0 | 0 | 0 | 3 | 33 | 3 | 7 |

Aggregators were asked if they had been inspected at any time during the past five years. Most respondents reporting inspections said that they occurred at their home where they were holding chickens prior to sale. Three-quarters of respondents in Chiang Mai reported having been inspected.

Village or district organizations were most likely to have conducted inspections. The DLD had inspected four percent of respondents. Respondents in Khon Kaen were the least likely to have been inspected with 40 percent of respondents reporting inspections, all from the local village organization. Aggregators in Nakhon Phanom were the most likely to be inspected. Moreover, one-

third of all respondents reported being inspected by the DLD, much higher than in any other province.

## Other Aggregator Activities

Aggregators were asked if they participated in any other aspects of poultry trade. More than six in ten respondents in every province reported also selling chickens from a market space (vending stall). Respondents in Chiang Mai were the most likely to also raise chickens. Respondents in Chiang Mai and Nakhon Phanom reported some occurrence of operating informal slaughtering businesses and respondents in every province were unlikely to report trading eggs.

# Market Vendor Survey

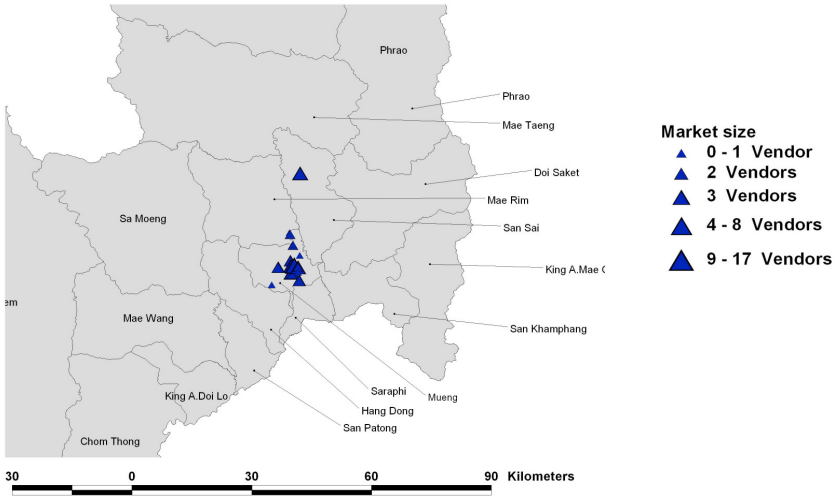
Enumerators visited all of the wet markets inside the capital district of each province. There were 16 markets in Chiang Mai, nine markets in Khon Kaen, and four markets in Nakhon Phanom.

**Table 22.** Vendor sample by location.

| | Chiang Mai | | Khon Kaen | | Nakon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Expected | Actual | Expected | Actual | Expected | Actual | Expected | Actual |
| Nr of Observations | 72 | 65 | 64 | 56 | 24 | 25 | 161 | 146 |

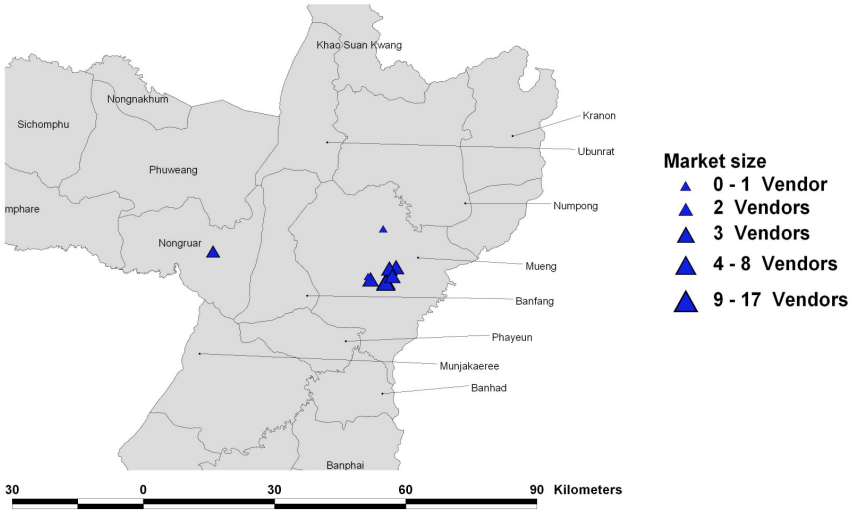
Actual observations approached expected observations in every province. There was limited to no problem with non-responses. The biggest problem was locating vendors at large 24-hour markets who only came for certain hours of the day. The largest volumes of trade took place in the middle of the night at the wholesale markets in each province. Fig. 18, 19 and 20 shows wet market locations.

**Figure 18.** Map of wet markets in Chiang Mai.



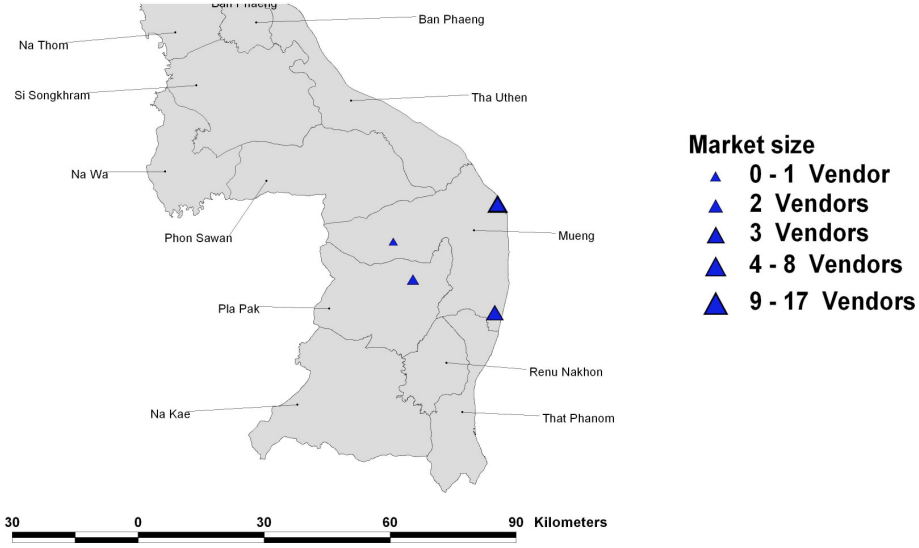

GPS maps of wet markets in Chiang Mai that was included in the survey. All of the markets included were in the capital district except for one large wholesale market located in San Sai district.

**Figure 19.** Map of wet markets in Khon Kaen.




GPS map of wet markets in Khon Kaen that were included in the survey. All of the markets included were in the capital district except for one market to the east where traders from other provinces sold chickens to be brought to the capital.

**Figure 20.** Map of wet markets in Nakhon Phanom.



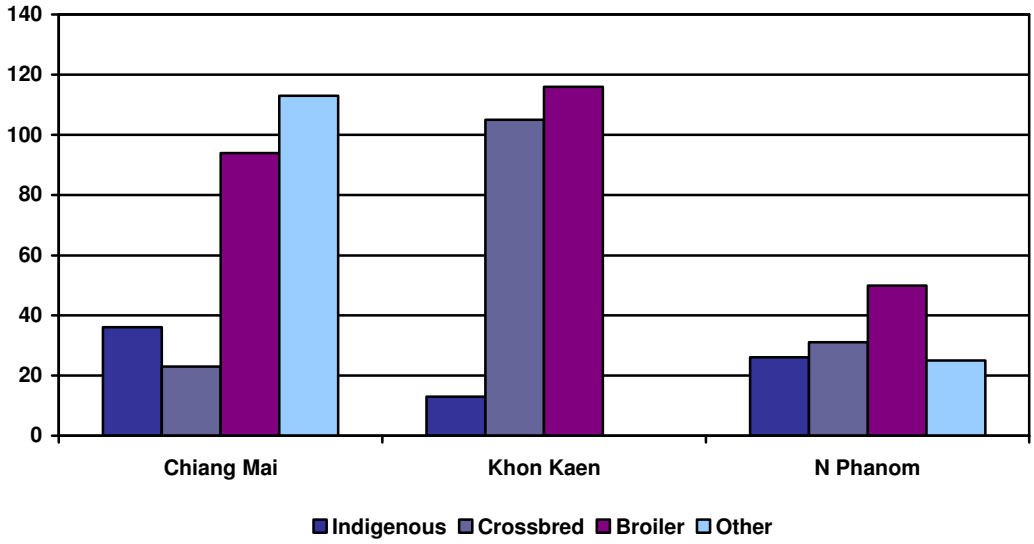

GPS map of wet markets surveyed in Nakhon Phanom. There were less markets because many transactions occurred at the farm gate or by delivery.

The following sections review vendor's characteristics, sales, margins, and clienteles.

## Vendor Household Characteristics

Vendors in all three provinces tended to be female with more than 75 percent of total respondents being female. Vendors in Chiang Mai and Nakhon Phanom tended to be older with close to 50 percent over the age of 45. In Khon Kaen, however, a majority of vendors were between the ages of 30 and 45. On average, vendors in Chiang Mai had five more years of experience than vendors in other provinces. The vast majority of vendors have permanent (fixed) market spaces.

**Figure 21.** Daily trading volume of breeds (birds sold per day) by location.




In each province, broiler chickens make up the largest volume of daily chicken sales. Khon Kaen vendors sold the highest volume of broiler and crossbred chickens, with a notably high volume of

crossbred chickens (105 chickens compared to 23 and 31 in Chiang Mai and Nakhon Phanom respectively). Chiang Mai vendors sold the highest volume of indigenous chickens.

In Nakhon Phanom close to half of vendors purchase live birds and slaughter them before bringing meat to market. In Chiang Mai and Khon Kaen aggregators are more likely to play a role in slaughtering birds. Vendors and their family members were responsible for almost all slaughtering.

In each province, vendors were most likely to sell broiler chickens. Khon Kaen was the only province in which vendors were more likely to sell crossbred chickens than indigenous chickens. Broiler chickens made up a large majority of sales volume with close to 95 percent in Chiang Mai and Khon Kaen, and 85 percent of sales in Nakhon Phanom. Nakhon Phanom had the largest volume of indigenous chicken sale by percentage with 5.9 percent of total sales.

## Source of Chicken Sold and Margins

In Chiang Mai and Khon Kaen most vendors purchase broiler chickens directly from large, integrated industrial companies. Companies often employ deliverymen who, similarly to an aggregator, deliver chickens to the vendor at the marketplace. However, these transactions were not recorded as purchases from aggregators because the company deliverymen never own chickens; they only deliver them for the company. Nakhon Phanom had the largest percentage of purchases coming directly from farmers with 25 percent of total purchases.

Vendors were likely to have verbal agreements with traders who regularly delivered chickens to their home. Moreover, many vendors had verbal agreements with large company farms. In fact, close to 3 percent of respondents had official written agreements with companies to sell their chicken in a wet market.

CP was the most common source of broiler chickens in Chiang Mai and Khon Kaen. Chiang Mai had the most variety of companies that vendors purchase chickens from. All of the Nakhon Phanom vendors purchasing brand name chickens purchased from Saha Farm which has large farms in nearby Mukdahan province.

**Table 23.** Vendor brand-name purchasing habits.

| Company Farm Source | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| CP | 52.9 | 61.7 | 0 | 54.8 |
| Saha | 11.3 | 0 | 100 | 9.6 |
| Nakhon Ping | 9.4 | 6.4 | 0 | 7.7 |
| Lam Tong | 5.6 | 0 | 0 | 2.9 |
| Betagro | 9.4 | 23.4 | 0 | 15.4 |
| RPM | 11.4 | 8.5 | 0 | 9.6 |

Purchasing and sales prices for indigenous chickens were similar in Chiang Mai and Nakhon Phanom resulting in a premium of about 20 baht per kg of indigenous chicken. However, in Nakhon Phanom the purchasing prices was seven baht higher and the sale price was 6 to 9 baht lower per kg of chicken. Sale prices of indigenous chickens tend to hover around 89 baht ($2.50) each.

Crossbred chickens tended to be less expensive than indigenous chickens but more expensive than broiler chickens. However, while the selling price of crossbred chicken was lower than indigenous chicken in Chiang Mai, the purchase price was the same. Crossbred chicken in Nakhon Phanom was significantly cheaper than in other provinces.

Chiang Mai had the lowest purchase and sale prices; however, Khon Kaen vendors average similar price mark-ups. Vendors in Nakhon Phanom had the lowest price mark-ups with every breed sold.

**Table 24.** Average prices for chicken types by locations (in THB = Thai Baht).

| Price | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| ***Indigenous*** | | | | |
| Purchase Price | 71 | 70 | 77 | 72 |
| Sale Price | 93 | 90 | 84 | 89 |
| Price Mark-ups | 22 | 20 | 7 | 16 |
| ***Crossbred*** | | | | |
| Purchase Price | 71 | 65 | 59 | 65 |
| Sale Price | 78 | 76 | 64 | 72 |
| Price Mark-ups | 7 | 11 | 5 | 7 |
| ***Broilers*** | | | | |
| Purchase Price | 48 | 54 | 59 | 53 |
| Sale Price | 54 | 60 | 62 | 58 |
| Price Mark-ups | 6 | 6 | 3 | 5 |

For all locations concerned, mark-ups are higher for indigenous (16 THB) chickens, followed by crossbred (7 THB) chickens, and finally industrial broilers (5 THB) chickens. From lowest to highest, consumers are willing to pay at least 9 to 11 baht more for quality traits (taste and texture).

## Vendor Clients

End users were the most common purchasers of chickens (79%). Restaurant and shop owners were the second most common consumers in Nakhon Phanom and Khon Kaen while other vendors were the second most common in Chiang Mai.

**Table 25.** Vendor clients (percent)

| Client | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| End user | 78.5 | 81.0 | 75.6 | 78.8 |
| Restaurant / shop | 9.0 | 13.5 | 18.0 | 12.3 |
| Other vendors | 12.3 | 5.5 | 3.6 | 8.4 |
| Other | 0.2 | 0 | 0 | 0.7 |

## Other Vendor Activities

Vendors in Chiang Mai were most likely to participate in trading while vendors in Khon Kaen and Nakhon Phanom were most likely to sell other meats. For example, one in five vendors in Nakhon Phanom also sold other types of poultry.

# Contract Farmer Survey

Surveys were conducted at broiler and layer contract farms within the covered region. The characteristics of farms varied greatly based on their role in the supply chain, type of contract, and which contracting company employed them.

Most large farms are located in Central Thailand; however, there are some broiler farms in the north and northeast. There turned out to be less contract farms than expected in each province. There were no contract farms in Nakhon Phanom. Most of the broiler chickens sold in the markets in Nakhon Phanom were grown on farms in neighbouring Mukdahan province.

**Table 26.** Contractor sample by location.

| | Chiang Mai | | Khon Kaen | | Nakon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Expected | Actual | Expected | Actual | Expected | Actual | Expected | Actual |
| Nr of Observations | 31 | 27 | 32 | 15 | 12 | 0 | 75 | 42 |

Enumerators asked to speak with the person(s) responsible for farming activities. Close to seven in ten were males overall. Respondents were asked how many people they employed on their farm. Family members were included only if they were paid, and on average, close to four individuals work per farm.

## Contract Farmer Characteristics

Respondents were asked how long they have been raising chicken, how long they have had a contract, and how long they have been using EVAP systems. Most respondents did not have much farming experience before they received contracts suggesting that there may not be much movement between smallholder farming and contract farming. Among the ten percent of respondents who stopped farming, 60 percent stopped because they pursued other employee opportunities and 40 percent stopped because their chickens were culled.

## Incomes from and Costs of Contract Farming

Respondents were asked to report their income from raising chicken, crops, other wages from other jobs, and any other investments they maintained. Our question excluded transfers from family members out of simplicity. The below table summarizes the findings.

**Table 27.** Contractor income statistics by location (Thousand Baht).

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| Annual Income | 575 | 697 | 641 | 1,818 | 598 | 1,199 |
| Annual Income from Raising Chicken (2007) | 352 | 583 | 608 | 1,826 | 444 | 1,170 |
| Annual Income from Raising Chicken (2002) | 330 | 590 | 594 | 1,829 | 424 | 1,175 |

Respondents were asked about the initial investments that were made before they were able to raise chickens with a contract.

**Table 28.** Initial cost of outfitting farms to be suitable for a rearing contract (Thousand Baht).

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| Cost | Mean | SD | Mean | SD | Mean | SD |
| Total costs | 1,500 | - | 579 | 205 | 746 | 415 |
| Costs for a closed system | - | - | 325 | 69 | 325 | 69 |
| Costs for EVAP system | - | - | 550 | - | 550 | - |

**Table 29.** Financing of poultry raising.

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| Source of finance | Freq. | % | Freq. | % | Freq. | % |
| Formal bank loan | 23 | 85.2 | 12 | 80.0 | 35 | 83.3 |
| Informal loan | 3 | 11.1 | 0 | 0 | 3 | 7.1 |
| Income from another job | 11 | 40.7 | 0 | 0 | 11 | 26.2 |
| Loan from contractor | 13 | 48.2 | 6 | 40.0 | 19 | 45.2 |
| Personal savings | 20 | 74.0 | 3 | 20.0 | 23 | 54.8 |

Most respondents had formal bank loans and many also had loans from contracting companies. Some respondents in Chiang Mai also had borrowed money from their friends or family. Excessive debt is a common problem among contract farmers. This is a problem that is exacerbated by losses due to diseases, as farmers face finance charges and restocking costs to restart operations.

**Table 30.** Types of chickens raised (Percent).

| | Chiang Mai | Khon Kaen | Total |
|---|---|---|---|
| Broilers | 26 | 20 | 21 |
| Layer pullets | 52 | 40 | 48 |
| Layers | 22 | 40 | 31 |

Average prices reported were 12.3 and 11.0 Baht ($0.30) for day-old broiler chicks in Chiang Mai and Khon Kaen respectively while the sales price for mature broilers was 35 and 40 Baht ($1) in these locations. Day-old layer chicks had an average cost of 15.2 Baht, increasing to 120 Baht at point of lay while spent hens would be sold at an average price of 45.2 Baht.

Respondents were asked what their contracts stipulated. All respondents had pre-agreed purchase times, prices, and quantities. Most also received feed, chicks, vaccines and veterinary services. Some also were provided with production technologies such as EVAP systems which would be paid back through money taken out of other payments. Four of ten contracts deal with layers (Table 30).

Most respondents in Chiang Mai were registered with the DLD; however, respondents in Khon Kaen reported no interaction with the DLD. Registration, they said, increases the chances of culling.

## Sanitary Measures and Inspections

About 30 percent of respondents in Chiang Mai had experienced culling, all in 2004. All of the respondents whose chickens were culled reported culling of the entire flock. Compensation was received in each case. Interestingly, contract farmers reported receiving higher compensation per bird than smallholders even though indigenous chickens receive higher prices than broiler chicken.

**Table 31.** Sanitary measures in selected locations.

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| Measure | Freq. | % | Freq. | % | Freq. | % |
| Medicine | 18 | 66.7 | 15 | 100 | 33 | 78.8 |
| Vaccines | 16 | 59.3 | 13 | 86.7 | 29 | 69.1 |
| Closed farming system | 25 | 92.6 | 13 | 86.7 | 38 | 90.5 |
| Chicken facility located away from home | 2 | 7.4 | 10 | 66.7 | 12 | 28.6 |
| Clean chicken holding facility regularly | 27 | 100 | 15 | 100 | 42 | 100 |
| Other precautions | 9 | 33.3 | 0 | 0 | 9 | 21.4 |

As expected, contract farmers were more likely to use vaccines and medicines than smallholders (this may be due to the fact they receive a pre-established growth programme). In addition, all respondents reported cleaning their facilities regularly. The DLD inspected all but one farm on a regular basis.

## Contract Farmer Concerns

Respondents were asked to rank their worries about the following issues on a scale of 0 to 3 with 0 being not concerned, 1 a little concerned, 2 somewhat concerned, and 3 very concerned.

**Table 32.** Ranking of poultry farmers' concerns (percent of respondents) by location.

| Rank | Low Demand | HPAI | Government culling | Lack of capital | Other disease | Other |
|---|---|---|---|---|---|---|
| ***Chiang Mai*** | | | | | | |
| 0 | 100 | 70.4 | 70.4 | 85.2 | 44.4 | 77.8 |
| 1 | 0 | 0 | 0 | 0 | 37.0 | 7.4 |
| 2 | 0 | 18.5 | 25.8 | 11.1 | 14.8 | 3.7 |
| 3 | 0 | 11.1 | 3.7 | 3.7 | 3.7 | 11.1 |
| ***Khon Kaen*** | | | | | | |
| 0 | 100 | 66.7 | 73.3 | 93.3 | 73.3 | 60.0 |
| 1 | 0 | 26.7 | 20.0 | 0 | 26.7 | 33.3 |
| 2 | 0 | 6.7 | 6.7 | 6.7 | 0 | 6.7 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 |

In Chiang Mai, the biggest concerns were HPAI and government culling with more than one-quarter of respondents somewhat or very worried about it. In Khon Kaen, respondents were less concerned in general. The biggest concern in Khon Kaen was excessive levels of debt with two in five respondents being at least a little worried about debt.

# Policy Recommendations

Our detailed investigations of the smallholder poultry supply chain in Thailand, based on interviews with consumers, farmers, ex-farmers, farmer networks, traders, and vendors, show that recent changes in market conditions, as an indirect result of the HPAI outbreaks, are making it very difficult for small-scale poultry farmers to sustain their ongoing rural enterprises.

Our observations suggest that, despite the absence of large outbreaks since mid 2004, there have been significant movements out of the native chicken sector during 2006 and 2007. Households who grew chickens in the past continue to do so for own consumption, but they see sharply diminished prospects of a livelihood from this form of livestock.

In particular, our results suggest that smallholder poultry could continue to contribute to local markets and diets, that Thai consumers still exhibit clear preferences for local varieties (indigenous chickens), and that these markets could in turn make important contributions to rural poverty alleviation and rural family nutrition.

It is also apparent from our results that smallholder farmers are linked to downstream actors through networks of low-income intermediary enterprises, meaning that their continued viability secures pro-poor multiplier effects on the Thai economy.

For these reasons, we recommend that this evidence be more fully considered in formulating socially effective and sustainable HPAI control strategies, particularly if avian influenza becomes endemic. Poultry sector transition will surely continue in Thailand, but abrupt changes fuelled by animal health policies, could destabilize livelihoods among the country's economically vulnerable rural majority.

The detailed findings from three regional poultry markets indicate a broad spectrum of socially constructive policy responses that will advance HPAI risk reduction while improving economic conditions for poor farmers who are the majority population in rural Thailand.

To begin with, the government can reinforce the efforts of farming groups that currently practice safe production practices (fencing, cleaning, disinfection, species separation, etc), while actively recruiting farmers interested in doing so. These efforts can be modelled on western agricultural producer cooperatives, who are the primary guarantors of product quality and safety in OECD countries.

Access to information and technology can be improved for smallholder farmers, particularly with respect to product quality, pricing, demand dynamics, and other market conditions. On the financial side, micro-credit schemes can accelerate technology adoption and small enterprise modernization, improving product quality/reliability and leading eventually to established brands/reputation that confer higher long term value added at lower transaction costs.

Professional training is also important, especially for product certification and enforcement of standards with veterinarians and technicians playing a pivotal role. Similarly, rudimentary education with respect to contracting, negotiation, and conflict resolution would improve the terms of smallholder market participation.

Local officials need to be better informed about the socioeconomic benefits of sustainable smallholder supply chains. The government can play a critical constructive role in these pro-poor supply networks by supporting grassroots producer cooperation, extension services, and generally maintaining an environment congenial to small enterprise development. This would include, but not

be limited to, strengthening of veterinary institutions, providing intellectual property protection, supporting development of third-party standards, and reputation building through labelling or branding programmes, improving existing market infrastructure, and developing small wholesale markets with registered slaughterhouse facilities in strategic urban locations.

The willingness-to-pay results of our study surveys indicate that consumers put a significant premium on traditional poultry varieties that have historically been produced by smallholders. This means that many product developments and upgrading initiatives could, if implemented rigorously, eventually be self-financed, a welcome substitute for open-ended fiscal commitments to public disease monitoring and geographically extensive control measures. Willingness to pay for traditional poultry also suggests that the general public has a distinct preference for sustained production of traditional varieties, contradicting the pressures from conventional HPAI policy to phase out this product line.

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# Annex 1: Household / Consumer Survey

**Table A1.1.** Gender of survey respondents.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Gender | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Male | 144 | 29.2 | 161 | 27.7 | 75 | 26.3 | 380 | 28.0 |
| Female | 349 | 70.8 | 420 | 72.3 | 210 | 73.7 | 979 | 72.0 |

**Table A1.2.** Age of survey respondents.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Age class | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| <30 | 115 | 23.3 | 91 | 15.7 | 25 | 8.8 | 231 | 17.0 |
| 30-45 | 166 | 33.7 | 190 | 32.7 | 128 | 44.9 | 484 | 35.6 |
| 46-60 | 150 | 30.4 | 176 | 30.3 | 99 | 24.7 | 425 | 31.3 |
| >60 | 62 | 12.6 | 124 | 21.3 | 33 | 11.6 | 219 | 16.1 |

**Table A1.3.** Household sizes in selected locations.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Household size | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| 1 | 36 | 7.2 | 18 | 3.1 | 9 | 3.2 | 63 | 4.6 |
| 2 | 100 | 20.1 | 91 | 15.7 | 29 | 10.2 | 220 | 16.1 |
| 3 | 112 | 22.6 | 122 | 21.0 | 48 | 16.8 | 282 | 20.7 |
| 4 | 134 | 26.9 | 134 | 23.1 | 76 | 26.7 | 344 | 25.2 |
| 5 | 53 | 10.6 | 96 | 16.5 | 66 | 23.7 | 215 | 15.8 |
| 6 | 32 | 6.4 | 65 | 11.2 | 29 | 10.2 | 126 | 9.2 |
| 7 | 16 | 3.2 | 29 | 5.0 | 18 | 6.3 | 63 | 4.6 |
| 8 | 6 | 1.2 | 14 | 2.4 | 6 | 2.1 | 26 | 1.9 |
| >8 | 9 | 1.8 | 12 | 2.1 | 4 | 1.4 | 25 | 1.8 |
| Mean | 3.7 | | 4.2 | | 4.3 | | 4.0 | |

**Table A1.4.** Monthly household income (Baht) in selected locations.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Monthly income | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| 0 - 10,000 | 157 | 31.9 | 186 | 32.1 | 161 | 56.5 | 504 | 37.1 |
| 10,001 - 20,000 | 162 | 32.9 | 198 | 34.1 | 74 | 26.0 | 434 | 32.0 |
| 20,001 - 30,000 | 73 | 14.8 | 88 | 15.2 | 31 | 10.9 | 192 | 14.1 |
| 30,001 - 40,000 | 40 | 8.1 | 43 | 7.4 | 13 | 4.5 | 96 | 7.1 |
| 40,001 - 50,000 | 24 | 4.9 | 33 | 5.7 | 3 | 1.1 | 60 | 4.4 |
| >50,000 | 37 | 7.5 | 32 | 5.5 | 3 | 1.1 | 72 | 5.3 |

**Table A1.5.** Frequency of market visits in selected locations.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Frequency of visit | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| < 1 time / day | 302 | 61.3 | 218 | 37.5 | 89 | 31.2 | 609 | 44.8 |
| 1 time / day | 149 | 30.2 | 290 | 49.9 | 127 | 44.6 | 566 | 41.7 |
| > 1 time /day | 42 | 8.5 | 73 | 12.6 | 69 | 24.2 | 184 | 13.5 |

**Table A1.6.** Weekly food expenditure for all respondents (baht/week) by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Food expenditure | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Eat out (incl. take away) | 693.3 | 759.6 | 666.1 | 740.0 | 553.6 | 564.5 | 652.4 | 715.8 |
| Eat in (preparing food) | 746.5 | 1,172.9 | 882.3 | 708.0 | 785.1 | 1,575.6 | 812.6 | 1,111.5 |
| Meat | 296.2 | 366.4 | 486.6 | 512.9 | 396.3 | 961.3 | 398.6 | 601.6 |
| Eggs | 34.2 | 34.2 | 52.0 | 96.5 | 100.9 | 362.3 | 55.8 | 180.1 |
| All Poultry meat | 43.1 | 61.9 | 45.1 | 56.8 | 77.5 | 172.8 | 51.2 | 95.9 |
| Chicken meat | 42.3 | 60.2 | 44.4 | 55.6 | 75.0 | 170.7 | 50.0 | 94.3 |

**Table A1.7.** Number of households purchasing unprepared / raw chicken.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| No. of HH | 277 | 55.2 | 119 | 54.9 | 142 | 49.8 | 738 | 54.1 |

**Table A1.8.** Weekly household expenditures on meat and eggs among households purchasing chicken.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Item | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| All meats | 427.9 | 361.4 | 677.7 | 547.4 | 555.6 | 1,312.3 | 560.6 | 721.6 |
| Eggs | 47.0 | 29.7 | 65.9 | 124.4 | 96.4 | 100.7 | 64.7 | 96.3 |
| All poultry meats | 76.9 | 65.3 | 82.0 | 53.4 | 155.5 | 218.9 | 94.2 | 113.6 |
| Chicken meat | 75.6 | 63.1 | 80.8 | 51.8 | 150.6 | 217.4 | 92.3 | 111.9 |

**Table A1.9.** Reasons stated by households for not purchasing chickens.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Reason | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Don't cook at home | 127 | 58.5 | 132 | 51.0 | 50 | 35.0 | 309 | 49.9 |
| Don't like chicken | 61 | 28.2 | 103 | 40.0 | 54 | 37.8 | 218 | 35.3 |
| Worry about disease | 5 | 2.3 | 0 | 0 | 4 | 2.8 | 9 | 1.5 |
| Vegetarian | 9 | 4.1 | 1 | 0.4 | 5 | 3.5 | 15 | 2.4 |
| Raise own chicken | 0 | 0 | 20 | 7.8 | 35 | 24.5 | 55 | 13.7 |
| Other | 29 | 13.2 | 17 | 6.7 | 0 | 0 | 17 | 6.7 |
| No. Observations | 216 | | 259 | | 143 | | 617 | |

**Table A1.10.** Kitchen availability and eating habits of respondents.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Have kitchen and can eat-in | 370 | 74.3 | 450 | 77.3 | 235 | 82.5 | 1,051 | 77.3 |
| Do not have a kitchen, eat out | 127 | 25.7 | 132 | 22.7 | 50 | 17.5 | 309 | 22.7 |

**Table A1.11.** Weekly household chicken consumption among households that purchase chickens.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Chicken consumed | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| kg / week | 1.0 | 0.9 | 1.0 | 0.7 | 2.0 | 3.1 | 1.2 | 1.6 |

**Table A1.12.** Purchasing habits by chicken breeds in selected locations.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Breed | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Broiler | 178 | 35.7 | 164 | 88.2 | 75 | 73.5 | 417 | 60.6 |
| Crossbreeds | 99 | 19.9 | 1 | 0.5 | 10 | 9.8 | 110 | 16.0 |
| Indigenous | 123 | 24.7 | 21 | 11.3 | 17 | 16.7 | 161 | 23.4 |

**Table A1.13.** Form of chicken purchased (percent) in selected locations.

| | Chiang Mai | | | Khon Kaen | | | Nakhon Phanom | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Breed | Live | Whole | Parts | Live | Whole | Parts | Live | Whole | Parts | Live | Whole | Parts |
| Broiler | 0 | 2.7 | 97.2 | 0 | 6.0 | 94.0 | 0 | 35.1 | 64.9 | 0 | 14.6 | 85.4 |
| Crossbreeds | 0 | 5.1 | 94.9 | 0 | 0 | 100 | 0 | 70.0 | 30.0 | 0.3 | 25.0 | 74.7 |
| Indigenous | 5.0 | 47.1 | 47.9 | 14.3 | 76.2 | 9.5 | 11.8 | 88.2 | 0 | 10.4 | 70.5 | 19.1 |

**Table A1.14.** Average price of chickens by breed and form purchased (Baht/kg).

| | Chiang Mai | | | Khon Kaen | | | Nakhon Phanom | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Breed | Live | Whole | Parts | Live | Whole | Parts | Live | Whole | Parts | Live | Whole | Parts |
| Broiler | - | 58 | 63 | - | 77 | 79 | - | 71 | 79 | - | 69 | 74 |
| Crossbreeds | - | 74 | 71 | - | - | 117 | - | 75 | 84 | - | 75 | 91 |
| Indigenous | 103 | 100 | 104 | 93 | 96 | 105 | 77 | 97 | - | 91 | 98 | 105 |

**Table A1.15.** Proportion of respondents expressing taste preferences for breeds (percent).

| Breed | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Broiler | 35 | 31 | 35 | 33 |
| Crossbreeds | 9 | 3 | 15 | 8 |
| Indigenous | 56 | 66 | 50 | 59 |

**Table A1.16.** Food shopping location preferences in selected locations (percent).

| Location | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Wet markets | 72 | 76 | 70 | 74 |
| Corner markets | 1 | 12 | 33 | 15 |
| Supermarkets | 26 | 10 | 6 | 13 |
| Trader / Farmer | 1 | 4 | 3 | 2 |

**Table A1.17.** Motivation for purchasing brand name chickens (percent).

| Reason | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Safety | 76 | 80 | 92 | 81 |
| Convenience | 46 | 88 | 69 | 72 |
| Packaging / preparation | 54 | 71 | 72 | 66 |
| Taste | 10 | 11 | 38 | 16 |
| Price | 8 | 9 | 38 | 15 |
| Size | 3 | 13 | 21 | 12 |
| Other | 3 | 0 | 0 | 1 |

**Table A1.18.** Responses on knowledge of source of origin of unbranded chickens.

| Knowledge of source | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| None | 225 | 88.9 | 251 | 80.5 | 91 | 65.0 | 567 | 80.4 |
| Farm | 26 | 10.3 | 50 | 16.0 | 44 | 31.4 | 120 | 17.0 |
| City | 2 | 0.8 | 11 | 3.6 | 5 | 3.5 | 18 | 2.6 |

**Table A1.19.** Certification programme interest expressed by respondents.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Interested in buying certified chicken | 196 | 71.3 | 244 | 75.8 | 120 | 84.5 | 560 | 75.8 |
| Observations | 275 | | 322 | | 142 | | 739 | |

**Table A1.20.** Willingness to pay for certified *indigenous* chickens.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Premium | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Pay 0 Baht extra | 32 | 23.7 | 17 | 11.7 | 8 | 23.5 | 57 | 18.2 |
| Pay 10 Baht extra | 103 | 76.3 | 128 | 88.3 | 26 | 76.5 | 257 | 81.8 |
| Pay 15 Baht extra | 44 | 32.6 | 16 | 11.0 | 10 | 29.4 | 70 | 22.3 |
| Pay 20 Baht extra | 11 | 8.1 | 11 | 7.6 | 5 | 14.7 | 27 | 8.6 |
| Pay 25 Baht extra | 4 | 3.0 | 4 | 2.8 | 2 | 5.9 | 10 | 3.2 |
| Pay 30 Baht extra | 3 | 2.2 | 4 | 2.8 | 1 | 2.9 | 8 | 2.5 |
| Observations | 135 | | 145 | | 34 | | 314 | |

**Table A1.21.** Willingness to pay for certified *crossbred* chickens.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Premium | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Pay 0 Baht extra | 7 | 14.3 | 2 | 10 | 3 | 27.3 | 12 | 13.0 |
| Pay 10 Baht extra | 41 | 85.7 | 18 | 90 | 8 | 82.8 | 80 | 87.0 |
| Pay 15 Baht extra | 12 | 24.5 | 2 | 10 | 2 | 18.2 | 27 | 29.3 |
| Pay 20 Baht extra | 6 | 12.2 | 0 | 0 | 1 | 9.1 | 7 | 7.6 |
| Pay 25 Baht extra | 1 | 2.0 | 0 | 0 | 1 | 9.1 | 2 | 2.2 |
| Pay 30 Baht extra | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Observations | 49 | | 20 | | 11 | | 92 | |

**Table A1.22.** Willingness to pay for certified *broiler* chickens.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Premium | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Pay 0 Baht extra | 41 | 20.4 | 28 | 11.0 | 25 | 21.7 | 94 | 16.5 |
| Pay 10 Baht extra | 160 | 79.6 | 226 | 89.0 | 90 | 78.3 | 476 | 83.5 |
| Pay 15 Baht extra | 72 | 35.8 | 27 | 10.6 | 11 | 9.6 | 110 | 19.3 |
| Pay 20 Baht extra | 27 | 13.4 | 18 | 7.1 | 4 | 3.5 | 49 | 8.6 |
| Pay 25 Baht extra | 10 | 5.0 | 5 | 2.0 | 0 | 0 | 15 | 2.6 |
| Pay 30 Baht extra | 8 | 4.0 | 4 | 1.6 | 0 | 0 | 12 | 2.1 |
| Observations | 201 | | 254 | | 115 | | 570 | |

**Table A1.23.** Why people don't want to pay for safety certified chickens.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Reason | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Do not want to pay extra for a system like this | 8 | 16.3 | 14 | 45.2 | 5 | 14.7 | 27 | 23.7 |
| Worried system inspections will be unreliable | 23 | 46.9 | 15 | 48.4 | 24 | 70.6 | 62 | 54.3 |
| Not enough information about the programme | 31 | 63.3 | 2 | 6.5 | 10 | 29.4 | 43 | 37.7 |
| Satisfied with the level of safety of chicken purchased | 2 | 4.1 | 0 | 0 | 0 | 0 | 2 | 1.8 |
| Observations | 54 | | 32 | | 34 | | 120 | |

**Table A1.24.** Why people don't want to pay for certified *indigenous* chickens.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Reason | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Do not want to pay extra for a system like this | 4 | 12.5 | 13 | 46.4 | 2 | 8.0 | 19 | 22.4 |
| Worried system inspections will be unreliable | 10 | 31.3 | 13 | 46.4 | 19 | 76.0 | 42 | 49.4 |
| Not enough information about the programme | 21 | 65.6 | 2 | 7.1 | 7 | 28.0 | 30 | 35.3 |
| Satisfied with the level of safety of chicken purchased | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Observations | 32 | | 28 | | 25 | | 85 | |

**Table A1.25.** Why people don't want to pay for certified *crossbred* chickens.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Reason | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Do not want to pay extra for a system like this | 3 | 42.9 | 0 | 0 | 1 | 33.3 | 4 | 33.3 |
| Worried system inspections will be unreliable | 5 | 71.4 | 2 | 100 | 1 | 33.3 | 8 | 66.7 |
| Not enough information about the programme | 2 | 28.6 | 0 | 0 | 1 | 33.3 | 3 | 25.0 |
| Satisfied with the level of safety of chicken purchased | 1 | 14.3 | 0 | 0 | 0 | 0 | 1 | 8.3 |
| Observations | 7 | | 2 | | 3 | | 12 | |

**Table A1.26.** Why people don't want to pay for certified *broiler* chickens.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Reason | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Do not want to pay extra for a system like this | 5 | 12.2 | 7 | 41.2 | 2 | 25.0 | 14 | 21.2 |
| Worried system inspections will be unreliable | 16 | 39.0 | 9 | 52.9 | 6 | 75.0 | 31 | 47.0 |
| Not enough information about the programme | 30 | 73.2 | 1 | 5.9 | 2 | 25.0 | 33 | 50.0 |
| Satisfied with the level of safety of chicken purchased | 2 | 4.9 | 0 | 0 | 0 | 0 | 2 | 3.0 |
| Observations | 41 | | 17 | | 8 | | 66 | |

# Annex 2: Farmer Survey

**Table A2.1.** Gender of survey respondents.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Gender | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Male | 381 | 61.7 | 300 | 50.9 | 240 | 58.4 | 921 | 56.9 |
| Female | 237 | 38.4 | 289 | 49.1 | 171 | 41.6 | 697 | 43.1 |

**Table A2.2.** Age of survey respondents.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Age class | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| <30 | 6 | 1.0 | 26 | 4.4 | 25 | 6.1 | 57 | 3.5 |
| 30-45 | 50 | 8.1 | 186 | 31.6 | 157 | 38.2 | 393 | 24.3 |
| 46-60 | 279 | 45.2 | 242 | 41.1 | 163 | 39.7 | 684 | 42.3 |
| >60 | 283 | 45.8 | 135 | 22.9 | 66 | 16.0 | 484 | 29.9 |

**Table A2.3.** Farming household sizes in selected locations.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Household size | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Nr. of people | 3.3 | 1.4 | 4.7 | 1.6 | 4.1 | 1.6 | 4.1 | 1.7 |

**Table A2.4.** Work experience of respondents.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Work experience | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Years | 22.7 | 16.5 | 22.8 | 14.7 | 14.5 | 11.3 | 20.7 | 15.1 |

**Table A2.5.** Financing of poultry production by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Source of finance | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Formal bank loan | 2 | 0.3 | 1 | 0.2 | 1 | 0.2 | 4 | 0.3 |
| Informal loan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ancillary Income | 346 | 56.0 | 566 | 96.3 | 126 | 30.7 | 1,038 | 64.2 |
| Personal savings | 586 | 94.8 | 579 | 98.5 | 405 | 98.5 | 1,570 | 97.1 |
| Other | 3 | 0.5 | 4 | 0.7 | 1 | 0.2 | 8 | 0.5 |

**Table A2.6.** Organizational affiliation in selected locations.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Affiliation | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Registered with DLD | 6 | 1.0 | 1 | 0.2 | 87 | 21.2 | 94 | 5.8 |
| Associated with farmer network | 3 | 0.5 | 32 | 5.4 | 63 | 15.3 | 98 | 6.1 |

**Table A2.7.** Breeds of chickens raised by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Breeds | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Indigenous | 655 | 100 | 443 | 100 | 405 | 98.3 | 1,503 | 99.4 |
| Crossbred | 0 | 0 | 1 | 0.2 | 0 | 0 | 1 | <0.1 |
| Broilers | 1 | 0.2 | 0 | 0 | 2 | 0.5 | 3 | 0.2 |
| Layers | 1 | 0.2 | 1 | 0.2 | 6 | 1.2 | 8 | 0.4 |

**Table A2.8.** Number of fighting cocks raised and people doing so by location.

| Description | | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|---|
| No. households raising fighting cocks | Freq. | 184 | 47 | 102 | 333 |
| | % | 27.6 | 8.0 | 24.8 | 20.6 |
| No. of fighting cocks raised | Mean | 4.9 | 8.4 | 8.7 | 6.5 |
| | SD | 5.1 | 11.3 | 7.5 | 7.3 |
| | Max. | 30 | 50 | 50 | 50 |

**Table A2.9.** Number of farmers buying chicks.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Source of chicks | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Sell chicks | 10 | 1.6 | 6 | 1.0 | 13 | 3.2 | 29 | 1.9 |
| Stock own farm | 617 | 99.8 | 585 | 99.4 | 328 | 98.5 | 1,530 | 98.4 |
| Buy chicks | 3 | 0.5 | 4 | 0.7 | 17 | 5.2 | 24 | 1.6 |

**Table A2.10.** Farmers selling eggs (percent of respondents) by location.

| Farmers selling eggs | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Proportion (%) | 6.4 | 8.3 | 8.9 | 28.3 | 5.6 | 3.9 | 6.7 | 14.8 |

**Table A2.11.** Chicken farmgate price by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Price | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Baht/kg | 61.4 | 6.6 | 59.9 | 4.7 | 59.2 | 7.7 | 60.5 | 6.3 |

**Table A2.12.** Buyers of indigenous chickens from farmers

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Buyer | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Aggregator | 320 | 51.9 | 45 | 10.0 | 241 | 12.4 | 395 | 30.2 |
| Market uendor | 239 | 38.7 | 24 | 5.3 | 113 | 46.9 | 376 | 0.39 |
| End user | 250 | 40.5 | 438 | 97.1 | 170 | 70.2 | 858 | 65.5 |
| Slaughterhouse | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | 4 | 0.3 | 0 | 0 | 0 | 0 | 2 | 0.2 |

**Table A2.13.** Buyer-seller relationships (percent).

| | Chiang Mai | | | Khon Kaen | | | Nakhon Phanom | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Buyer | None | Verbal | Formal | None | Verbal | Formal | None | Verbal | Formal | None | Verbal | Formal |
| Aggregator | 53.0 | 47.0 | 0 | 58.1 | 41.9 | 0 | 55.9 | 44.1 | 0 | 56.2 | 43.8 | 0 |
| Vendors | 35.2 | 64.8 | 0 | 60.0 | 40.0 | 0 | 51.6 | 48.4 | 0 | 39.0 | 61.0 | 0 |
| End users | 78.0 | 22.0 | 0 | 99.3 | 0.7 | 0 | 55.7 | 44.3 | 0 | 86.4 | 13.6 | 0 |

**Table A2.14.** Items covered by verbal agreements (In percentages).

| Agreement | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Time | 94.6 | 96.0 | 77.1 | 91.3 |
| Price | 87.0 | 84.0 | 81.9 | 85.8 |
| Quantity | 87.0 | 84.0 | 81.9 | 85.8 |
| Discount[1] | 0 | 0 | 0 | 0 |

[1] for regular purchases

**Table A2.15.** Number of buyers in the past year.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Buyers | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Number | 2.9 | 6.2 | 5.1 | 3.4 | 3.7 | 3.1 | 3.8 | 4.9 |

**Table A2.16.** Income from eggs by location.

| Description | | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|---|
| Respondents selling eggs | Freq. | 8 | 1 | 6 | 15 |
| | % | 1.3 | 0.2 | 1.5 | 1.0 |
| Percent of income from eggs | Mean | 14.4 | 26.2 | 50.0 | 29.4 |
| | SD | 24.5 | - | 28.3 | 29.9 |

**Table A2.17.** Number of people raising ducks and other poultry by location.

| Description | | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|---|
| No. raising ducks | Freq. | 78 | 81 | 53 | 212 |
| | % | 11.9 | 18.3 | 12.9 | 14.0 |
| Percent of flock | Mean | 24.2 | 30.0 | 23.0 | 26.2 |
| | SD | 15.6 | 20.0 | 16.4 | 17.8 |
| No. raising other poultry | Freq. | 2 | 2 | 1 | 5 |
| | % | 0.3 | 0.4 | 0.2 | 0.3 |
| Percent of flock | Mean | 32.0 | 7.6 | 10.0 | 17.7 |
| | SD | 12.0 | 5.9 | - | 14.3 |

**Table A2.18.** Other income-related activities undertaken by respondents.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Activity | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Market Space | 9 | 1.4 | 2 | 0.3 | 9 | 2.2 | 20 | 1.3 |
| Trading of chickens from other farms | 3 | 0.5 | 0 | 0 | 1 | 0.2 | 4 | 0.3 |
| Slaughtering chickens from other farms | 11 | 1.7 | 0 | 0 | 1 | 0.2 | 12 | 0.8 |

**Table A2.19.** Culling by Ampur by location.

| | Respondents | Flock culled | |
|---|---|---|---|
| Ampur | No. | Frequency | Percentage |
| ***Chiang Mai*** | | | |
| Doi Saket | 119 | 0 | 0 |
| Hang Dong | 99 | 17 | 17.2 |
| Mae Rim | 93 | 0 | 0 |
| Mae Tang | 46 | 2 | 4.4 |
| Sarapee | 100 | 6 | 6.0 |
| San Kampang | 83 | 38 | 45.8 |
| San Patong | 63 | 0 | 0 |
| San Sai | 63 | 0 | 0 |
| ***Khon Kaen*** | | | |
| 1 | 4 | 0 | 0 |
| 2 | 88 | 0 | 0 |
| 3 | 118 | 4 | 3.4 |
| 7 | 43 | 0 | 0 |
| 8 | 12 | 0 | 0 |
| 9 | 56 | 8 | 14.3 |
| 10 | 8 | 0 | 0 |
| 19 | 7 | 0 | 0 |
| 21 | 10 | 0 | 0 |
| 24 | 98 | 0 | 0 |
| ***Nakhon Phanom*** | | | |
| 1 | 117 | 5 | 4.3 |
| 2 | 19 | 0 | 0 |
| 3 | 70 | 3 | 4.3 |
| 5 | 183 | 10 | 5.5 |
| 8 | 8 | 0 | 0 |
| 10 | 14 | 0 | 0 |

**Table A2.20.** Changes in flock size since farmer's chickens were culled (percent of respondents)

| Flock size | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Increased | - | 8.3 | 41.7 | 25.0 |
| Same | - | 33.3 | 50.0 | 37.5 |
| Decreased | - | 58.3 | 8.3 | 33.3 |

**Table A2.21.** Overview of farm inspections (percent of respondents).

| | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| At least one inspection | 80.2 | 47.9 | 85.9 | 72.3 |
| Village organization | 44.8 | 35.4 | 41.4 | 41.1 |
| District organization | 30.5 | 1.6 | 6.8 | 15.6 |
| Tesaban organization | 10.1 | 0.9 | 1.2 | 5.0 |
| DLD | 1.7 | 10.8 | 31.6 | 12.5 |

**Table A2.22.** Farmer concerns by location

| | Low Demand | | HPAI | | Government Culling | | Lack of capital | | Other disease | | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rank | Freq. | % | Freq. | % | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| ***Chiang Mai*** | | | | | | | | | | | | |
| 0 | 641 | 97.7 | 341 | 52.0 | 410 | 62.5 | 471 | 71.8 | 319 | 81.0 | 365 | 55.6 |
| 1 | 11 | 1.7 | 30 | 4.6 | 29 | 4.4 | 79 | 12.0 | 29 | 7.4 | 100 | 15.2 |
| 2 | 2 | 0.3 | 88 | 13.4 | 82 | 12.5 | 72 | 11.0 | 33 | 8.4 | 136 | 20.7 |
| 3 | 2 | 0.3 | 197 | 30.0 | 135 | 20.6 | 34 | 5.2 | 13 | 3.3 | 55 | 8.4 |
| ***Khon Kaen*** | | | | | | | | | | | | |
| 0 | 439 | 99.1 | 344 | 77.7 | 401 | 90.5 | 434 | 98.0 | 323 | 72.9 | 399 | 90.1 |
| 1 | 4 | 0.9 | 80 | 18.1 | 29 | 6.6 | 8 | 1.8 | 93 | 21.0 | 29 | 6.6 |
| 2 | 0 | 0 | 18 | 4.1 | 8 | 1.8 | 0 | 0 | 26 | 5.9 | 11 | 2.5 |
| 3 | 0 | 0 | 1 | 0.2 | 5 | 1.1 | 1 | 0.2 | 1 | 0.2 | 4 | 0.9 |
| ***N. Phanom*** | | | | | | | | | | | | |
| 0 | 384 | 93.4 | 278 | 67.6 | 335 | 81.5 | 269 | 65.5 | 286 | 69.6 | 406 | 98.8 |
| 1 | 23 | 5.6 | 54 | 13.1 | 45 | 11.0 | 92 | 22.4 | 74 | 18.0 | 0 | 0 |
| 2 | 3 | 0.7 | 61 | 14.8 | 19 | 4.6 | 43 | 10.5 | 37 | 9.0 | 2 | 0.5 |
| 3 | 1 | 0.3 | 18 | 4.4 | 12 | 2.9 | 7 | 1.7 | 14 | 3.4 | 3 | 0.7 |

# Annex 3: Aggregator Survey

**Table A3.1.** Gender of traders.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Gender | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Male | 18 | 72 | 4 | 40 | 2 | 22 | 24 | 55 |
| Female | 7 | 28 | 6 | 60 | 7 | 78 | 20 | 45 |

**Table A3.2.** Age of traders.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Age class | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| <30 | 0 | 0 | 0 | 0 | 2 | 22.2 | 2 | 4.6 |
| 30-45 | 1 | 4 | 2 | 20 | 5 | 55.6 | 8 | 18.2 |
| 46-60 | 10 | 40 | 6 | 60 | 2 | 22.2 | 18 | 40.9 |
| >60 | 14 | 56 | 2 | 20 | 0 | 0 | 16 | 36.4 |

**Table A3.3.** Years of experience of traders.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Work experience | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Years | 13.1 | 13.0 | 7.4 | 11.7 | 7.4 | 5.2 | 10.6 | 11.7 |

**Table A3.4.** Monthly trading volume and sources / destinations by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Work experience | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Chickens traded | 202 | 220 | 240 | 144 | 240 | 144 | 260 | 343 |
| Farmers purchased from | 37 | 98 | 28 | 28 | 17 | 19 | 21 | 76 |
| Traders purchased from | 0.7 | 1 | 0.9 | 1.5 | 3.0 | 4.3 | 1.2 | 2.4 |
| Sources sold to | 67 | 94 | 111 | 171 | 59 | 77 | 76 | 112 |

**Table A3.5.** Trading by breed in selected locations*.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Breed | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Indigenous | 25 | 100 | 10 | 100 | 5 | 55.6 | 40 | 90.9 |
| Crossbred | 1 | 4 | 0 | 0 | 0 | 0 | 1 | 2.3 |
| Broilers | 3 | 12 | 0 | 0 | 3 | 33.3 | 6 | 13.6 |
| Other | 1 | 4 | 0 | 0 | 1 | 11.1 | 2 | 5.3 |

* Number of aggregators who trade at least some of each breed.

**Table A3.6.** Area where chicken is purchased by location (Percent).

| Source | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Same Muban (village) | 42 | 14 | 16 | 30 |
| Same Tambon (district) | 75 | 41 | 43 | 61 |
| Same Ampur (city) | 91 | 64 | 62 | 79 |
| Same Changwat (province) | 99 | 100 | 78 | 95 |
| Different Changwat | 1 | 0 | 22 | 5 |

**Table A3.7.** Area where chickens are sold by location.

| Destination | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Same Tambon (district) | 64 | 39.0 | 23.3 | 45.9 |
| Same Ampur (city) | 90 | 21 | 88.9 | 23.6 |
| Same Changwat (province) | 100 | 60 | 100 | 19.1 |
| Different Changwat | 0 | 40 | 0 | 11.4 |

**Table A3.8.** How often are chicken traded with any type of certificate? (Percent).

| Frequency | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Never | 100 | 100 | 33 | 89 |
| Sometimes | 0 | 0 | 67 | 11 |
| Always | 0 | 0 | 0 | 0 |

**Table A3.9.** Slaughtering and selling practices of aggregators in selected locations (Percent).

| Frequency | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| ***Purchase*** | | | | |
| Live | 96 | 80 | 100 | 94 |
| Slaughtered | 4 | 20 | 0 | 6 |
| ***Sale*** | | | | |
| Live | 22 | 30 | 0 | 19 |
| Slaughtered | 78 | 70 | 100 | 81 |

**Table A3.10.** Numbers of nights birds are held.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Nights held | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| No. | 1.2 | 1.6 | 0.8 | 0.8 | 1.3 | 0.8 | 1.2 | 1.3 |

**Table A3.11.** Person who slaughters birds by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Trader | 17 | 74 | 4 | 80 | 2 | 22 | 23 | 66 |
| Family members (not involved in trading) | 5 | 22 | 1 | 20 | 4 | 44 | 10 | 27 |
| Someone else (not involved in trading) | 1 | 4 | 0 | 0 | 3 | 33 | 4 | 11 |

**Table A3.12.** Chicken prices (Baht/kg) in selected locations.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Chicken price | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Purchase price | 66.0 | 5.6 | 63.5 | 8.8 | 67.5 | 6.4 | 65.5 | 6.4 |
| Sale price | 91.0 | 13.3 | 82.0 | 13.2 | 90.0 | 21.2 | 88.6 | 14.5 |
| Mark-up | 25.0 | 12.2 | 18.5 | 10.6 | 23.0 | 17.9 | 23.1 | 12.5 |

**Table A3.13.** Source of purchase by location (Percent).

| Source | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Farmer | 97.5 | 98.5 | 99.4 | 98.4 |
| Another Trader | 2.5 | 1.5 | 0.6 | 1.6 |

**Table A3.14.** Type of agreement for aggregators purchasing chickens.

| | Chiang Mai | | | Khon Kaen | | | Nakhon Phanom | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seller | None | Verbal | Formal | None | Verbal | Formal | None | Verbal | Formal | None | Verbal | Formal |
| Farmer | 40 | 60 | 0 | 37.5 | 62.5 | 0 | 57 | 43 | 0 | 42.5 | 57.5 | 0 |
| Trader | 43 | 57 | 0 | 100 | 0 | 0 | - | - | - | 33.3 | 66.7 | 0 |

**Table A3.15.** Type of agreement for aggregators selling chickens.

| | Chiang Mai | | | Khon Kaen | | | Nakhon Phanom | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Buyer | None | Verbal | Formal | None | Verbal | Formal | None | Verbal | Formal | None | Verbal | Formal |
| End users | 72 | 28 | 0 | 100 | 0 | 0 | 50 | 50 | 0 | 72 | 28 | 0 |
| Vendors | 20 | 80 | 0 | 0 | 100 | 0 | 0 | 100 | 0 | 10 | 90 | 0 |
| Restaurant/Shop | 25 | 75 | 0 | 100 | 0 | 0 | 50 | 50 | 0 | 60 | 40 | 0 |
| Trader | 100 | 0 | 0 | 100 | 0 | 0 | - | - | - | 100 | 0 | 0 |
| Slaughterhouse | 0 | 100 | 0 | NA | NA | NA | NA | NA | NA | 0 | 100 | 0 |

**Table A3.16.** What do verbal agreements entail? (Percent).

| Agreement | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Time | 95 | 85.7 | 83.3 | 90.9 |
| Price | 100 | 85.7 | 100 | 97.0 |
| Quantity | 100 | 71.4 | 100 | 93.9 |
| Discount[1] | 30 | 0 | 0 | 18.2 |

[1] for regular purchases

**Table A3.17.** Inspections by location (percent inspected).

| | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| At least one inspection[1] | 76 | 40 | 78 | |
| Village organization | 32 | 40 | 44 | |
| District organization | 32 | 0 | 11 | |
| Tesaban organization | 8 | 0 | 22 | |
| DLD | 8 | 0 | 33 | |

[1] in last five years

**Table A3.18.** Trader alternative activities (percent).

| Alternative | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Raise own chickens for sale | 40 | 10 | 11 | 27 |
| Raise own poultry (other than chicken) for sale | 4 | 0 | 0 | 2 |
| Sell chicken from a stall in a market | 68 | 60 | 67 | 66 |
| Trade other types of poultry | 16 | 0 | 0 | 9 |
| Run a slaughtering business (slaughtering birds that you don't trade) | 44 | 0 | 33 | 32 |
| Trade Eggs | 4 | 0 | 0 | 2 |

# Annex 4: Vendor Survey

**Table A4.1.** Gender of respondents by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Gender | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Male | 20 | 30.8 | 9 | 16.1 | 4 | 16.0 | 33 | 22.6 |
| Female | 45 | 69.2 | 47 | 83.9 | 21 | 84.0 | 113 | 77.4 |

**Table A4.2.** Age of respondents by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Age class | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| <30 | 13 | 20.0 | 8 | 14.3 | 1 | 4.0 | 22 | 15.1 |
| 30-45 | 20 | 30.8 | 35 | 62.5 | 11 | 44.0 | 66 | 45.2 |
| 46-60 | 31 | 47.7 | 12 | 21.4 | 12 | 48.0 | 55 | 37.7 |
| >60 | 1 | 1.5 | 1 | 1.8 | 1 | 4.0 | 3 | 2.0 |

**Table A4.3.** Years of experience as market vendor.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Work experience | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Years | 15.5 | 8.0 | 9.5 | 8.0 | 9.8 | 8.7 | 12.2 | 8.6 |

**Table A4.4.** Availability of market space in selected locations.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Market space | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Permanent | 65 | 100 | 52 | 92.9 | 22 | 88.0 | 139 | 95.2 |
| Temporary | 0 | 0 | 4 | 7.1 | 3 | 12.0 | 7 | 4.8 |

**Table A4.5.** Daily trading volume of breeds (birds sold per day) by location.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Breed | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Indigenous | 36 | 29.8 | 13 | 5.6 | 26 | 36.8 | 23 | 26.7 |
| Crossbred | 23 | 15.0 | 105 | 65 | 31 | 30.1 | 61 | 60.0 |
| Broiler | 94 | 137 | 116 | 235 | 50 | 42.5 | 95 | 173 |
| Other | 113 | 124 | 0 | - | 25 | 26.5 | 44 | 62.7 |

**Table A4.6.** Type of chickens purchased and sold by respondents.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| ***Purchase*** | | | | | | | | |
| Live | 5 | 7.7 | 12 | 21.4 | 11 | 45.8 | 28 | 19.3 |
| Slaughtered | 60 | 92.3 | 44 | 78.6 | 13 | 54.2 | 117 | 80.7 |
| ***Sale*** | | | | | | | | |
| Live | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Slaughtered | 65 | 100 | 56 | 100 | 24 | 100 | 145 | 100 |

**Table A4.7.** Who slaughters birds?

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Vendor | 2 | 40 | 6 | 50 | 9 | 81.8 | 17 | 60.7 |
| Other Family Members | 3 | 60 | 6 | 50 | 1 | 9.1 | 10 | 35.7 |
| Outside hired help | 0 | 0 | 1 | 8.3 | 0 | 0 | 1 | 3.6 |
| Other | 0 | 0 | 0 | 0 | 1 | 9.1 | 1 | 3.6 |

**Table A4.8.** Vendors selling each breed.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Breed | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Indigenous | 8 | 12.3 | 12 | 21.4 | 10 | 40.0 | 30 | 20.5 |
| Crossbred | 4 | 6.2 | 7 | 22.5 | 5 | 20.0 | 16 | 11.0 |
| Broiler | 56 | 86.1 | 46 | 82.1 | 21 | 84.0 | 123 | 84.2 |
| Other | 2 | 3.0 | 0 | 0 | 8 | 32.0 | 10 | 6.8 |

**Table A4.9.** Percent of trade volume by breed in selected locations.

| Breed | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Indigenous | 2.5 | 2.4 | 5.9 | 2.7 |
| Crossbred | 1.6 | 4.1 | 3.6 | 3.0 |
| Broiler | 95.4 | 93.5 | 85.4 | 93.7 |
| Other | 0.5 | 0 | 5.1 | 0.6 |
| Total trade volume (Birds/day) | 5,478 | 5,547 | 1,025 | 12,050 |

**Table A4.10.** S ource of purchase by location.

| Source | Chiang Mai | Khon Kaen | Nakhon Phanom | Total |
|---|---|---|---|---|
| Trader (delivered at market) | 22.6 | 22.1 | 50.0 | 26.9 |
| Trader (delivered to vendor's home) | 6.5 | 5.9 | 8.3 | 6.5 |
| Farmer (inside the city) | 0 | 5.8 | 25.0 | 3.9 |
| Farmer (outside the city) | 6.6 | 9.4 | 0 | 6.3 |
| Company | 61.7 | 51.4 | 16.7 | 6.5 |
| Other Vendor | 2.6 | 7.1 | 0 | 49.9 |

**Table A4.11.** Pre-purchase contractual agreements by source and location.

| | Chiang Mai | | | Khon Kaen | | | Nakhon Phanom | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source | None | Verbal | Formal | None | Verbal | Formal | None | Verbal | Formal | None | Verbal | Formal |
| Trader – market delivered | 96.9 | 3.1 | 0 | 98.2 | 1.8 | 0 | 100 | 0 | 0 | 97.9 | 2.1 | 0 |
| Trader – home delivered | 66.1 | 33.9 | 0 | 67.9 | 32.1 | 0 | 52.0 | 48.0 | 0 | 64.4 | 35.6 | 0 |
| Farmer - inside city | 95.4 | 4.6 | 0 | 96.4 | 3.6 | 0 | 96.0 | 4.0 | 0 | 95.9 | 4.1 | 0 |
| Farmer - outside city | 96.8 | 3.1 | 0 | 96.4 | 3.6 | 0 | 100 | 0 | 0 | 97.3 | 2.7 | 0 |
| Company | 40.0 | 56.9 | 3.1 | 50.0 | 50.0 | 0 | 88.0 | 4.0 | 8.0 | 52.7 | 44.5 | 2.8 |

**Table A4.12.** Other related activities engaged by market vendors.

| | Chiang Mai | | Khon Kaen | | Nakhon Phanom | | Total | |
|---|---|---|---|---|---|---|---|---|
| Activity | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Sell other poultry | 1 | 1.5 | 4 | 7.1 | 5 | 20.0 | 10 | 6.9 |
| Sell other meat | 5 | 7.7 | 12 | 21.4 | 5 | 20.0 | 22 | 15.1 |
| Sell eggs | 0 | 0 | 5 | 8.9 | 2 | 8.0 | 7 | 4.8 |
| Trading business | 10 | 15.4 | 10 | 17.9 | 0 | 0 | 20 | 13.7 |
| Slaughtering business | 0 | 0 | 0 | 0 | 1 | 4.0 | 1 | 0.7 |
| Sell from other locations | 1 | 1.5 | 5 | 8.9 | 1 | 4.0 | 7 | 4.8 |

# Annex 5: Contract Farmer Survey

**Table A5.1.** Gender of respondents in selected locations.

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| Gender | Freq. | % | Freq. | % | Freq. | % |
| Male | 19 | 70.4 | 9 | 60.0 | 28 | 66.7 |
| Female | 8 | 29.6 | 6 | 40.0 | 14 | 33.3 |

**Table A5.2.** Age of respondents by location.

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| Age class | Freq. | % | Freq. | % | Freq. | % |
| <30 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-45 | 2 | 7.4 | 4 | 26.7 | 6 | 14.3 |
| 46-60 | 19 | 70.4 | 9 | 60.0 | 28 | 66.8 |
| >60 | 6 | 22.2 | 2 | 13.3 | 8 | 19.1 |

**Table A5.3.** Number of paid farm employees.

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| Employees | Mean | SD | Mean | SD | Mean | SD |
| No. | 3.0 | - | 3.9 | 2.1 | 3.9 | 2.1 |

**Table A5.4.** Years of working experience by respondents.

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| Experience | Mean | SD | Mean | SD | Mean | SD |
| Years Experience Farming | 11.9 | 7.2 | 10.2 | 4.0 | 11.3 | 6.2 |
| Years with a Contract | - | - | 9.6 | 3.8 | 9.6 | 3.8 |
| Years with EVAP System | 5.2 | 2.0 | 9.6 | 4.5 | 7.2 | 3.9 |

**Table A5.5.** Farm capacity (expressed as heads of chicken).

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| Capacity | Mean | SD | Mean | SD | Mean | SD |
| Current | 9,550 | 3,640 | 9,520 | 6,130 | 9,540 | 4,610 |
| Potential | 11,740 | 5,620 | 10,010 | 6,610 | 11,110 | 5,980 |

**Table A5.6.** Recent history of poultry raising behaviours.

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| | Freq. | % | Freq. | % | Freq. | % |
| Stopped raising chicken In the past 5 years (Other than a scheduled break) | 2 | 7.4 | 3 | 20.0 | 5 | 11.9 |

**Table A5.7.** Organizational affiliation in selected locations.

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| Affiliation | Freq. | % | Freq. | % | Freq. | % |
| Registered with DLD | 21 | 77.8 | 0 | 0 | 21 | 50.0 |
| Associated with Farmer Network | 1 | 3.7 | 1 | 6.7 | 2 | 4.8 |

**Table A5.8.** Provisions in contract agreements (Percent)

| Provision | Chiang Mai | Khon Kaen | Total |
|---|---|---|---|
| Price, time & quantity of Purchase | 100 | 100 | 100 |
| Feed | 88.9 | 100 | 94.3 |
| Chicks | 85.2 | 100 | 92.7 |
| Production technology | 7.4 | 46.2 | 29.6 |
| Veterinary services | 66.7 | 53.9 | 60.5 |
| Vaccines | 85.2 | 100 | 91.2 |

**Table A5.9.** Experience with culling

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| Flock culled | Freq. | % | Freq. | % | Freq. | % |
| Yes | 8 | 29.6 | 0 | 0 | 8 | 19.1 |

**Table A5.10.** Culling coverage in Chiang Mai.

| | Chiang Mai | | Khon Kaen | | Total | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| % of flock culled | 100 | - | - | - | - | - |
| No. of birds culled | 6,800 | 2,940 | - | - | - | - |
| Compensation / bird (Baht) | 56.1 | 16.7 | - | - | -- | - |

**Table A5.11.** Overview of farm inspections in selected locations (Percent).

| Provision | Chiang Mai | Khon Kaen | Total |
|---|---|---|---|
| At least one inspection[1] | 96.3 | 100 | 98.7 |
| Village organization | 3.7 | 38.1 | 24.2 |
| District organization | 0 | 0 | 0 |
| Tesaban organization | 0 | 0 | 0 |
| DLD | 96.3 | 100 | 98.7 |