



# Research Report

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## Poultry Market Institutions and Livelihoods: Evidence from Viet Nam

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### ABSTRACT

In developing countries, the success with which rural populations become formal sector market participants is critical to their sustained emergence from subsistence and poverty. The objective of this work, and the larger project from which it originates, is to improve understanding about how markets can act as catalysts for rural poverty alleviation. The larger Pro-Poor Livestock Policy Initiative (PPLPI) project deals with livestock generally, but in the present case we focus on poultry, a category of special economic and public health importance in the Southeast Asian region.

This report summarizes results from detailed surveys of poultry markets in and around Ha Noi, Viet Nam, which included separate surveys of six different supply-side market participants (consumers were the subject of a different survey): (1) Chicken Farmers; (2) Chick Producers; (3) Commune Traders; (4) Wholesale Traders; (5) Slaughterhouses; and (6) Market Vendors.

The results obtained offer diverse insights into complex economic institutions and their linkages, suggesting that many traditional practices can be reinforced for their desirable characteristics, while others could benefit from institutional innovations that improve the social effectiveness of outcomes. These surveys were relatively small pilot exercises, and would benefit from both more extensive and intensive sampling. However, having said this, the salient insights offer robust general policy guidance.

## 1. Introduction

Market participation can be measured simply in term of transactions, but more microeconomic examination shows how important detailed institutional characteristics are to outcomes. From a smallholder perspective, there are two main types of obstacles to market participation, (i) transactions costs and (ii) information failures. The former arise from logistical challenges (e.g. remoteness) and the financial constraints of subsistence poverty. Information failures permeate most of the market prospects facing the poor. For example, smallholder market participation is often limited by intermediaries on both sides (inputs and outputs) of their sector activities.

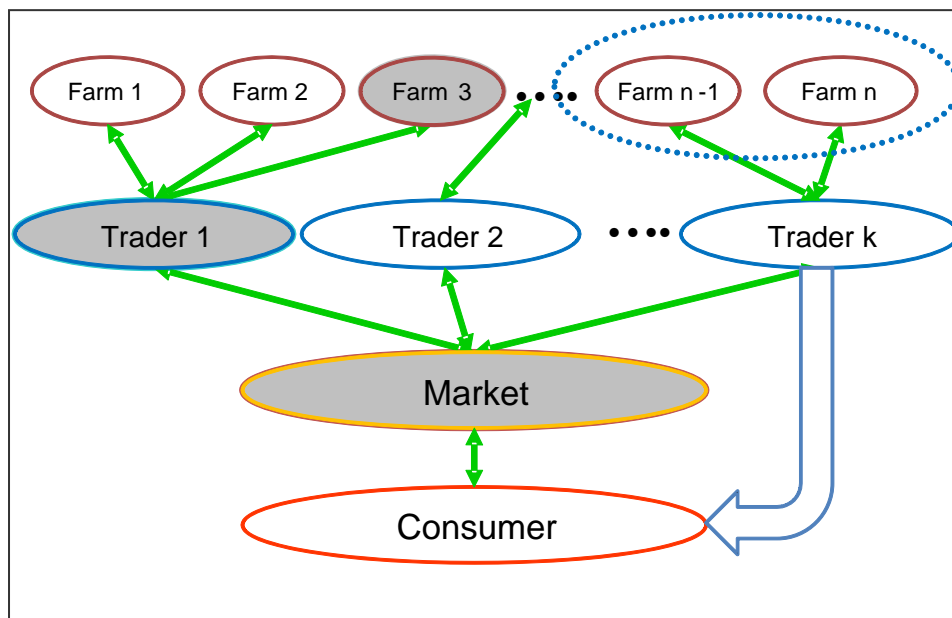
The intermediary problem limits smallholder progress through the food value chain, and it can have other important consequences, particularly for product quality. The quality problem has two parts, market power and moral hazard. Intermediaries use their proprietary information and market access to increase market power, monopsony power for buying intermediaries and monopoly power for resellers, and both contribute to a wedge of rents that could be shared by smallholder and consumer households in a more competitive environment. Moreover, alienating smallholders from consumer relationships undermines a primary incentive to invest in product quality, the premium that would accrue if their quality contribution could be consistently identified. Simply put, direct producer-consumer links foster a virtuous cycle of quality and value improvement, but this is wiped out when intermediaries interpose themselves, mask the identities of producers and consumers, and undermine value-added by commoditizing smallholder products.

Intermediary activities also contribute to moral hazard in rural-urban market systems. Because they aggregate outputs from many producers, usually destroying origin information in the process, intermediaries reduce buyer's capacity to assess product quality/risk and thereby contribute to adverse selection. Markets with identifiable origin information, by contrast, provide reputation incentives for producers to improve product quality/safety, and consumers can appropriately reward this.

Figure 1 illustrates this problem in the context of a contagious poultry disease. The traditional distribution system linking rural smallholder poultry producers and urban markets entails mixing bird stocks from different producers. In this way a single sub-standard operation (gray highlighting) can compromise the safety / quality of other stocks and entire markets. In an environment of uncertainty, this leads to moral hazard, strong adverse selection, and disincentives for quality maintenance or improvement. Because farmers who produce above-average quality birds cannot be identified, their product will be undervalued in such a market because buyers discount willingness to pay for any bird by average disease risk.

By contrast, if a single trader (k) establishes a reputation for quality; their birds can command a consistent premium. If this premium is in turn shared with upstream producers, such a dedicated market chain can sustain a virtuous quality/value cycle. Precisely this framework is the basis of contract farming (upstream) and producer cooperative marketing systems (downstream), both of which are hallmarks of transition to sustainably higher agricultural product value and income. Contract farming creates an upstream network to regulate quality and origin attributes, while producer cooperatives work in the other direction. In both cases, the disciplines of identification/traceability create a 'market' for consistent attributes that consumers can reward with confidence.<sup>1</sup>

**Figure 1: Poultry supply chain**



Thus agricultural markets present both opportunities and challenges for producers, intermediaries, consumers, and the policy makers who must oversee all these interactions. Clearly, however, the ultimate outcomes depend on the material characteristics of the products, markets, and above all the institutions of exchange. With more substantive insight into these, policies can more effectively facilitate desirable outcomes, including product safety, value creation generally, and rural poverty reduction in particular.

To promote this kind of evidence-based approach to policymaking, we conducted a series of detailed resource flow surveys of chicken markets in and around Ha Noi. This included separate

<sup>1</sup> One of the earliest and best known examples of this is the celebrated 19<sup>th</sup> century French regulation of wine origins, which is today exemplified by dramatic price and quality differentials across the country. Modern examples include products certified for environmental, labour, and other standards affecting consumer willingness to pay.

surveys of six different supply-side market participants (consumers were the subject of a different survey): (1) Chicken Farmers; (2) Chick Producers; (3) Commune Traders; (4) Wholesale Traders; (5) Slaughterhouses; and (6) Live Bird Market Vendors.

The results of these surveys are summarized in the following section. A large quantity of summary tables is presented, and rather than referring to them numerically, interpretive text precedes its respective table.

## 2. Overview of the Ha Noi Market Flow Surveys

### 2.1 Chicken Farmer Survey

For the purposes of this survey, chicken farmers are identified as individual farm households raising chickens for market. The smallholder producer pilot survey took place in 11 districts representing 4 provinces in July 2007. The last three (Chuong Mi, Dong Anh, & Yen Phong) are districts where large farmers (>1,000 broiler capacity) were targeted for interviews.

The total number of farmers to be interviewed was set at 600, the number assigned to each district being set proportional to population size. Sub-districts were ranked in ascending order based on uniformly distributed random numbers generated by statistical software (STATA). Enumerators visited sub-districts in this randomized order and identified the number of chicken farmers in the sub-district market. Enumerators also randomly selected the farmers to be interviewed.

#### *Chicken Farmer Characteristics*

Farmer households in this survey are primarily represented by adult males, with a significant minority of female farmers, but over 90% of the sample were middle aged or older. The latter fact is of significance for the rural-urban transition. As migration raises average age and dependency levels in the countryside, marketing of traditional agricultural products becomes more important to economic security.

**Table 1:** Gender and age of survey participants

Gender	Obs.	Age	Obs.
Male	401	<35	50
Female	226	35-45	279
		>45	298

As the age of these farmers suggests, they have considerable experience. Most trace their poultry marketing back to the beginning of the economic reform period, and thus have established livelihood dependence in poultry production. There is considerable and interesting

variance in farmer experience, however. This may have to do with de-collectivization and other land reform experiments, as well as with gradual enlargement of market access with recent infrastructure improvements. Only more detailed surveys can elucidate these issues.

**Table 2:** Years experience raising chicken

District	Mean	S.D.	Obs.
Gia Binh	8	7	75
Tien Du	10	8	79
Ly Nhan	9	6	76
Kim Bang	9	6	84
Soc Son	8	7	71
Tu Liem	9	6	55
Hoai Duc	10	12	61
Phu Xuyen	7	5	62
Chuong Mi	5	5	20
Dong Anh	9	4	37
Yen Phong	9	1	7

As has been observed in other studies of Southeast Asia, poultry products are an important source of income for the rural poor. In some regions as much as half of total income is derived from broiler production alone, while in most regions this income varies between 20% and 30%. For this reason, Viet Nam policies toward livestock generally and poultry in particular have momentous implications for poor farmers. Recent experience with HPAI indicates that smallholders are extremely sensitive to the policy environment, which is hardly surprising given the importance of this source of income.

**Table 3:** Percent of income generated from poultry production

District	Mean	S.D.	Obs.
Gia Binh	27	16	74
Tien Du	22	13	79
Ly Nhan	28	20	75
Kim Bang	21	15	84
Soc Son	22	13	71
Tu Liem	16	13	55
Hoai Duc	19	17	61
Phu Xuyen	20	12	62
Chuong Mi	51	29	20
Dong Anh	28	17	37
Yen Phong	34	22	7

Moreover, most poultry farmers report that, at the time of the survey, they were operating well below capacity, indicating that they could increase output and revenue from this source of household production by nearly double in most cases. From a livelihoods perspective, this presents an important opportunity for the government.

Basically, there are three ways to improve farm balance sheets: (i) increase output, (ii) reduce costs, and/or (iii) increase prices. The first is the traditional role of extension services, the Green Revolution productivity agenda for poor farmers. According to the results below, Viet Nam could go much further still toward this objective. Of course, productivity enabling policies must be complemented by market expansion to accommodate increased supply, otherwise the result will be familiar boom and bust price cycles.

**Table 4:** Productive capacity in use (%)

District	Mean	S.D.
Gia Binh	53	25
Tien Du	58	23
Ly Nhan	50	24
Kim Bang	57	26
Soc Son	47	26
Tu Liem	50	24
Hoai Duc	59	25
Phu Xuyen	57	24
Chuong Mi	89	17
Dong Anh	71	18
Yen Phong	64	23

Most farmers interviewed were relatively small commercial producers. The figures below refer to the number of chicken sold annually (batches \* average sales per batch). Recalling that we had roughly equal numbers of observations in each region (except Chuong Mi), it is clear that this is a heterogeneous sector, but the majority of operators are smallholders.

**Table 5:** Average annual sales

District	Mean	S.D.
Gia Binh	273	215
Tien Du	327	241
Ly Nhan	1,086	1,450
Kim Bang	219	226
Soc Son	1,040	1,379
Tu Liem	118	100
Hoai Duc	764	526
Phu Xuyen	295	234
Chuong Mi	835,625	3,687,022
Dong Anh	4,635	14,647
Yen Phong	1,314	1,251

### ***Chicken Varieties and Final Bird Produced***

There is a clear specialization in chicken varieties among the observed farmers. Smallholders produce mainly local / native varieties of chicken, which are traditional in their own and surrounding diets and well adapted to smallholder husbandry. At the opposite end of the scale

spectrum, the largest producers produce non-traditional varieties, crossbred or industrial chickens.

**Table 6:** Breeds / types of chicken produced

District	Local	Crossbred	Industrial	'Egypt'
Gia Binh	47%	52%	1%	0%
Tien Du	87%	9%	4%	0%
Ly Nhan	36%	24%	39%	1%
Kim Bang	67%	32%	1%	0%
Soc Son	40%	54%	6%	0%
Tu Liem	90%	5%	5%	0%
Hoai Duc	0%	100%	0%	0%
Phu Xuyen	14%	53%	31%	2%
Chuong Mi	0%	60%	40%	0%
Dong Anh	1%	71%	19%	7%
Yen Phong	21%	36%	43%	0%

Because of important festival events, particularly the Tet New Year festival in January/February, there is strong seasonality in Viet Nam chicken sales. Smallholders are particularly responsive to this cycle for two reasons: traditional birds (their specialty) are most in demand for these festivals and they also command a significant premium at this time. Large producers are more likely to smooth their production and marketing cycles over the year.

It is customary for farmers to keep a few hens, probably for their own egg consumption and as localized breeding stock, but these numbers are not sufficient to produce their marketable chicken+ stocks. Having said this, established hen keeping is a majority activity in only about half the observed districts.

**Table 7:** Farmers keeping hens, number of hens kept, and farmers selling chicks

District	Keeping hens %	Nr of hens kept		Selling chicks %
		Mean	S.D.	
Gia Binh	55	15	41	16
Tien Du	68	11	14	14
Ly Nhan	37	5	8	24
Kim Bang	57	13	16	27
Soc Son	34	35	140	10
Tu Liem	25	2	3	0
Hoai Duc	52	347	531	38
Phu Xuyen	66	88	101	44
Chuong Mi	20	360	745	0
Dong Anh	5	54	229	0
Yen Phong	43	571	787	0

A small percentage of farmers also produce chicks for sale, and most smallholders obtain their chicks from neighboring farms. Chick rearing appears to be quite specialized, with most farmers

in most districts buying from one or two sources only. This provides an opportunity for efficient animal health monitoring and upstream intervention.

### **Source of Chicks**

The majority of farmers report obtaining chicks locally, but the larger the producer, the more likely he is to obtain chicks from external sources. For this reason, most farmers may obtain chicks locally, but most chicks are probably transported between dispersed producers. This fact has important implications for animal health management.

**Table 8:** Location of farms from where chicks are obtained

District	Village	Commune	District	Own Province	Other Province	Market or Trader
Gia Binh	61%	19%	15%	6%	0%	0%
Tien Du	80%	19%	2%	0%	0%	0%
Ly Nhan	61%	25%	6%	0%	0%	0%
Kim Bang	82%	13%	4%	0%	0%	0%
Soc Son	64%	36%	0%	0%	0%	0%
Hoai Duc	12%	13%	10%	3%	21%	42%
Phu Xuyen	63%	2%	14%	4%	13%	5%

Significantly, however, traders do not seem to be an important source of chicks in our sample. Even the large producers who obtain chicks from more remote locations buy them directly from other farms.

**Table 9:** Source of chicks (%)

District	Own Farm	Other farms	Markets	Traders
Gia Binh	36	64	0	0
Tien Du	54	33	2	1
Ly Nhan	25	65	0	10
Kim Bang	48	45	4	3
Soc Son	12	78	0	10
Tu Liem	11	21	58	6
Hoai Duc	2	98	0	0
Phu Xuyen	8	89	0	2
Chuong Mi	0	100	0	0
Dong Anh	0	86	0	14
Yen Phong	0	100	0	0

Chick prices exhibit remarkable variance, across varieties and districts. Local chicks appear to be cheaper on average, with the adult birds being more expensive because of maturation time, but all prices vary significantly.

**Table 10:** Price paid for chicks (VN Dong)

District	Local		Crossbred		Industrial		'Egypt'	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Gia Binh	4,992	2,013	4,736	1,932	4,000	-	-	-
Tien Du	3,205	2,158	3,494	3,452	8,000	1,000	-	-
Ly Nhan	2,895	2,798	3,480	2,467	6,341	2,340	5,000	-
Kim Bang	2,856	3,080	3,326	2,351	3,350	212	-	-
Soc Son	4,337	1,325	8,818	7,861	6,750	2,754	5,000	-
Tu Liem	1,540	3,207	3,208	3,325	4,700	945	-	-
Hoai Duc	-	-	3,899	1,847	-	-	-	-
Phu Xuyen	4,675	1,920	6,085	3,120	5,750	2,534	5,000	-
Chuong Mi	-	-	8,040	4,349	8,000	1,069	-	-
Dong Anh	6,000	-	13,411	5,576	8,500	1,190	7,000	816
Yen Phong	3,433	981	5,500	1,414	5,400	1,039	-	-

Local and crossbred chicks tend to be older at the time of sale, probably due to less standardized production and distribution systems. In some cases, however, the ages are very much higher, indicating that there may be selection criteria for stocking these varieties. More detailed research would be needed to clarify this question.

**Table 11:** Average age of purchased chicks (days)

District	Local	Cross	Industrial
Gia Binh	3	2	1
Tien Du	6	3	1
Ly Nhan	12	4	1
Kim Bang	11	8	3
Soc Son	1	1	1
Tu Liem	33	16	1
Hoai Duc	-	1	-
Phu Xuyen	5	1	1
Chuong Mi	-	3	1
Dong Anh	1	1	1
Yen Phong	1	1	1

Vaccination status does not appear to be an independent cost for farmers. The vast majority of chicks are vaccinated, and very few farmers identify this as a decomposable expense.

**Table 12:** Premium (VN Dong) paid for vaccinated chicks

Premium	Obs.	%
0	333	89.8
100	1	0.3
175	1	0.3
200	19	5.1
300	11	3.0
500	3	0.8
1,000	3	0.8

### **Chicken (broiler) Sales**

Only a few farmers (about 10% of the sample) reported buying chicks with safety certification, but did not indicate paying a premium for this. Presumably, given the fact that chick vendors are near local monopolists (above results), farmers have little choice regarding this product characteristic.

Most broilers are sold when fully grown, although in a few districts up to 25% of broilers sold are not fully grown. The current survey does not trace the movement of individual birds, but trade in immature birds suggests some kind of production staging that may have important implications for value distribution and animal health.

**Table 13:** Percent of broilers sold when fully grown

District	Mean	S.D.
Gia Binh	83	14
Tien Du	74	15
Ly Nhan	87	8
Kim Bang	80	13
Soc Son	84	20
Tu Liem	75	21
Hoai Duc	84	7
Phu Xuyen	85	15
Chuong Mi	93	4
Dong Anh	87	6
Yen Phong	91	9

Most farms sell broilers once per month or less often. In some districts, there are farms that are selling more regularly. Most likely these are small local sales, as this estimate includes smaller sales that are not a part of 'batches'.

**Table 14:** Frequency of broiler sales

District	More than once per week	Every week	Every month	Less than once a month
Gia Binh	7	4	12	52
Tien Du	2	3	9	65
Ly Nhan	14	5	27	29
Kim Bang	7	5	16	56
Soc Son	0	4	18	49
Tu Liem	2	4	9	40
Hoai Duc	7	0	3	51
Phu Xuyen	15	0	6	41
Chuong Mi	0	0	5	15
Dong Anh	0	0	3	34
Yen Phong	0	0	0	7

The next three tables summarize price characteristics of the broiler market. As was reported in the consumer willingness to pay survey and in other downstream surveys in the present market

study, local chickens command a substantial and sustained premium (often over 50%) over other varieties. This differential generally intensifies during festival periods, although the chronic scarcity of chickens at Tet may narrow varietal price differences in some districts. In any case, we see over and over again that the variety grown by the poor in Viet Nam is the most sought after, and also contributes most to poultry market revenue and value added. Noting that these birds may also be more ecologically sustainable and resource efficient makes the case for promoting local varieties even stronger.

**Table 15:** Price (VN Dong/kg) for broilers at 'normal' periods

District	Local		Cross		Industrial		'Egypt'	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Gia Binh	42,133	4,869	33,967	4,110	28,000	-	-	-
Tien Du	43,014	5,746	34,300	7,499	23,333	6,110	-	-
Ly Nhan	39,194	4,180	24,609	7,114	16,970	1,630	-	-
Kim Bang	45,952	4,364	32,567	8,140	24,500	7,778	-	-
Soc Son	40,226	3,621	33,514	7,336	28,000	1,633	30,000	-
Tu Liem	50,547	4,379	29,333	1,155	30,500	9,469	-	-
Hoai Duc	-	-	31,721	3,527	-	-	-	-
Phu Xuyen	45,350	6,549	23,889	7,711	23,024	8,448	35,000	-
Chuong Mi	-	-	34,083	2,503	18,875	2,295	-	-
Dong Anh	32,000	-	33,464	2,349	18,143	1,069	32,750	2,986
Yen Phong	57,500	10,607	34,333	4,041	32,333	2,082	-	-
<b>Total</b>	<b>44,167</b>	<b>6,096</b>	<b>31,213</b>	<b>6,781</b>	<b>20,924</b>	<b>6,619</b>	<b>32,667</b>	<b>2,805</b>

**Table 16:** Price (VN Dong) for broilers at high demand period

District	Local		Cross		Industrial		'Egypt'	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Gia Binh	49,933	6,351	40,565	4,425	30,000	-	-	-
Tien Du	52,767	8,509	39,200	7,099	29,000	5,196	-	-
Ly Nhan	46,500	4,151	30,348	7,924	22,303	2,452	-	-
Kim Bang	53,238	6,074	39,133	8,174	26,500	4,950	-	-
Soc Son	48,667	6,748	38,921	4,907	31,750	2,363	38,000	-
Tu Liem	61,075	6,468	35,000	-	39,333	4,041	-	-
Hoai Duc	-	-	38,492	3,443	-	-	-	-
Phu Xuyen	53,700	7,761	29,764	8,676	27,381	8,164	37,000	-
Chuong Mi	-	-	40,167	3,460	23,938	1,321	-	-
Dong Anh	40,000	-	38,429	3,393	22,857	1,069	37,750	3,096
Yen Phong	60,000	14,142	38,333	3,512	39,000	3,606	-	-
<b>Total</b>	<b>52,783</b>	<b>8,075</b>	<b>37,264</b>	<b>6,830</b>	<b>25,818</b>	<b>6,460</b>	<b>37,667</b>	<b>2,422</b>

Price seasonality is very strong, adding premia of 15-30% to prices. The importance of this to smallholders, who can time the marketing of their slower growing varieties, is even greater relative to their incomes. This largely explains their consistent production timing strategy.

Most farmers report trading their local chicken locally, yet most chickens may not be since the largest producers did not report on this question. In any case, local marketing is a natural

response to the high transactions costs smallholders face, and indicates they may be missing higher value opportunities in downstream markets.

**Table 17: Buyers of local chicken (%)**

District	Com-mune / District Trader	Province Trader	Other Province Trader	Com-mune / District Market	Slaughter-house	Local End User	Ha Noi End User	Other
Gia Binh	51	4	0	3	0	41	0	0
Tien Du	48	3	2	6	0	40	1	0
Ly Nhan	46	38	9	0	0	7	0	0
Kim Bang	30	9	0	5	0	43	0	13
Soc Son	86	3	2	0	0	8	0	0
Tu Liem	1	0	0	4	0	93	1	0
Hoai Duc	-	-	-	-	-	-	-	-
Phu Xuyen	25	5	0	5	0	45	20	0
Chuong Mi	-	-	-	-	-	-	-	-
Dong Anh	100	0	0	0	0	0	0	0
Yen Phong	50	0	0	0	0	50	0	0
<b>Total</b>	<b>40</b>	<b>8</b>	<b>2</b>	<b>3</b>	<b>0</b>	<b>43</b>	<b>1</b>	<b>3</b>

Traders and local end users are the main buyers of crossbred chicken.

**Table 18: Buyers of crossbred chicken (%)**

District	Com-mune / District Trader	Province Trader	Other Province Trader	Com-mune / Wholes. Market	Slaughter-house	Local End User	Ha Noi End User	Other
Gia Binh	52	6	0	0	0	41	0	0
Tien Du	53	0	0	0	0	47	0	0
Ly Nhan	47	10	26	1	0	16	0	0
Kim Bang	34	13	15	3	0	9	0	26
Soc Son	24	61	4	0	0	3	0	8
Tu Liem	33	0	0	0	0	67	0	0
Hoai Duc	87	7	0	0	2	4	0	0
Phu Xuyen	8	71	0	0	0	17	5	0
Chuong Mi	50	42	0	0	0	0	0	8
Dong Anh	95	0	0	0	0	5	0	0
Yen Phong	0	0	100	0	0	0	0	0
<b>Total</b>	<b>51</b>	<b>23</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>15</b>	<b>1</b>	<b>4</b>

Industrial chickens seem to be sold to more distant locations, and less likely to be sold to local consumers. These larger producers are more likely to be articulated into supply chain systems, including large scale downstream customers and syndicated transport and distribution systems.

**Table 19:** Buyers of industrial chicken (%)

District	Com- mune / District Trader	Province Trader	Other Province Trader	Whole- sale Market	Slaugh- ter- house	Local End User	Ha Noi End User	Other
Gia Binh	0	0	0	0	0	100	0	0
Tien Du	0	33	27	0	33	7	0	0
Ly Nhan	56	19	22	0	0	2	0	0
Kim Bang	45	0	0	50	0	5	0	0
Soc Son	0	70	30	0	0	0	0	0
Tu Liem	38	0	0	0	0	63	0	0
Hoai Duc	-	-	-	-	-	-	-	-
Phu Xuyen	6	79	5	0	0	10	0	0
Chuong Mi	8	43	38	0	0	0	0	13
Dong Anh	90	0	0	0	0	0	0	0
Yen Phong	0	0	100	0	0	0	0	0
<b>Total</b>	<b>36</b>	<b>35</b>	<b>18</b>	<b>1</b>	<b>1</b>	<b>7</b>	<b>0</b>	<b>1</b>

Many chicken farmers also raise other types of poultry. Several farms derive a large part of their income from selling eggs for consumption. This is most common in the districts where larger farmers were surveyed.

**Table 20:** Percent of income from egg sales

District	Mean	S.D.
Gia Binh	2	9
Tien Du	0	0
Ly Nhan	1	4
Kim Bang	2	6
Soc Son	20	22
Tu Liem	0	0
Hoai Duc	11	17
Phu Xuyen	2	7
Chuong Mi	18	23
Dong Anh	31	21
Yen Phong	56	19

### ***Contractual Relations***

Most supply chain relationships of farmers are based on verbal, informal agreements. Less formal relationships are more common with end users. As Table 2.21 indicates, over 95% of trader relationships and 100% of non-commune market and slaughterhouse relationships are informal.

Near universal informality in smallholder supply chain relationships has advantages and disadvantages. The latter particularly include the transactions cost and information failure issues

raised earlier, and could fruitfully be examined in more detail to identify opportunities for improved efficiency, risk management, and value creation.

**Table 21:** ‘Contractual’ agreements of farmers (all districts)

Partner	None	Verbal	Formal
Commune Trader	4%	96%	0%
District Trader	4%	95%	1%
Province Trader	5%	95%	4%
Other Province Trader	2%	98%	0%
Commune Market	11%	89%	0%
District Market	0%	100%	0%
Wholesale Market	0%	100%	0%
Slaughterhouse	0%	100%	0%
End User Hanoi	33%	50%	17%
Local End User	23%	77%	0%

## 2.2 Chick Producer Survey

This survey covered farmers producing and marketing chicks in the study districts. Chick producers were identified through conversations with provincial and local authorities. Chick producers were either incubators or farmers with layers. A total of 33 chick producers was surveyed. This group shows a substantial amount of heterogeneity, particularly with respect to scale of production.

### *Chick Producer Characteristics*

Incubators are used to produce chicks by households who market them professionally. Capacities vary quite significantly across districts.

**Table 22:** Capacity of incubators

District	Mean	Obs.
Soc Son	5,500	2
Tu Liem	130,000	1
Hoai Duc	26,000	9
Phu Xuyen	42,676	17
Dong Anh	1,200,000	1
Yen Phong	43,333	3

Most chick producers have been in operation for at least ten years, but in some districts chick producers are very experienced (15+ years). Again, this is a very established local expertise, source of livelihood and source of localized genetic varieties.

As the incubator data suggest, scale of hen holdings varies greatly across this ‘sub-sector’, from an average of 250 hens in Soc Son to 70,000 hens in Dong Anh.

Survey participants were asked about the maximum number of chicks they could raise with existing facilities. Capacity use at the time of the survey varied widely across respondents. Whether this was due to seasonality can one be ascertained by repeated sampling, but as with broiler production we see substantial production potential that is not being realized.

**Table 23:** Capacity used at time of survey (%)

District	Mean	S.D.
Soc Son	54	29
Tu Liem	48	-
Hoai Duc	77	24
Phu Xuyen	58	27
Dong Anh	58	-
Yen Phong	74	13

As with chicken farming, chick production is managed primarily by mature males

**Table 24:** Gender and age of survey participants

Gender	Obs.	Age	Obs.
Male	25	<35	6
Female	8	35-45	20
		>45	7

### **Chick Sales**

Chick sales are bound to the production cycle of adult chickens, discussed in the previous section. Here again we see strong seasonality, with re-stocking after Tet and before the autumn seasonal upswing in demand. Driven by national holidays, these trends are robust across districts.

**Table 25:** Percentage increase in sales during peak months

Month	Mean	S.D.	Max
January	0	0	0
February	32	142	800
March	1	5	30
April	1	5	30
May	0	0	0
June	0	0	0
July	2	9	50
August	21	59	300
September	15	43	200
October	16	48	200
November	1	5	30
December	0	0	0

Commercial chick producers specialize in crossbred and industrial varieties, with their entire inventory sold at the age of approximately one day. This contrasts sharply with traditional or local chicken producers, whose chicks are grown and traded by local (usually neighbouring) farmers, at varying ages.

**Table 26:** Breeds of chicks produced

District	Local	Crossbred	Industrial	'Egypt'
Soc Son	0%	100%	0%	0%
Tu Liem	0%	100%	0%	0%
Hoai Duc	0%	79%	21%	0%
Phu Xuyen	1%	77%	8%	14%
Dong Anh	10%	60%	30%	0%
Yen Phong	17%	42%	17%	25%

Prices for chicks vary significantly between and within localities, for reasons not revealed in the current survey. Like adult chickens, chick prices can also increase significantly during high demand periods.

**Table 27:** Average chick prices (VN Dong)

District	Local		Crossbred		Industrial		'Egypt'	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Soc Son			4,000					
Tu Liem			3,500					
Hoai Duc			3,063	177	3,500	1,323		
Phu Xuyen	5,000		3,250	935	3,667	577	3,167	764
Dong Anh	3,000		2,500		4,000			
Yen Phong	3,500		4,000	1,323	3,000		6,000	

**Table 28:** Chick prices (VN Dong) during periods of high demand

District	Local		Crossbred		Industrial		'Egypt'	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Soc Son			5,000					
Tu Liem			4,500					
Hoai Duc			4,850	915	4,833	289		
Phu Xuyen	7,000		5,464	2,116	5,667	577	5,333	1,756
Dong Anh	7,000		5,500		21,000			
Yen Phong	7,000		6,433	814	5,500		12,000	

Unlike producers of chicks from local varieties, commercial chick producers rely significantly on traders to distribute their product to poultry farmers. This introduces an additional layer of uncertainty in the market channel.

**Table 29:** Proportion (%) of chick producers who sell to traders

District	Selling to Traders
Soc Son	0
Tu Liem	14
Hoai Duc	75
Phu Xuyen	59
Dong Anh	70
Yen Phong	38

Chick producers generally only sell to traders outside of their own district, with several selling over long distances. This market displacement, combined with informal contracts, introduces moral hazard into the supply chain because sellers and buyers do not necessarily know each other or have a means of communication independently of the trader.

**Table 30:** Origin of traders

District	Own Province	Neighbouring Provinces	Other Provinces
Hoai Duc	3%	0%	98%
Phu Xuyen	30%	31%	39%
Yen Phong	33%	7%	60%

Like most agricultural products in Viet Nam, particularly that of smallholders, chicks are mainly transported by motorbike. Trucking is used only by the largest producers who have contractual distribution systems and financial means to overcome the fixed cost hurdle for this transport medium. Such economies of scale are a primary reason for the creation of producer cooperatives, although it remains to be seen if long distance shipping is advantageous to the smallholder poultry industry. It might benefit chick producers to have access to a regional or national market, but it is unclear if local chicken farmers would actually buy out-of-district chicks to maintain their own flocks. Historically, they have relied on local chick producers, presumably because of a combination of cost effectiveness and preference for locally adapted bird varieties.

**Table 31:** Means of chick transport

District	Motorbike	Truck	Bike	Other
Soc Son	40%	0%	50%	10%
Tu Liem	50%	50%	0%	0%
Hoai Duc	81%	19%	0%	0%
Phu Xuyen	96%	4%	0%	0%
Dong Anh	30%	70%	0%	0%
Yen Phong	87%	11%	0%	2%

This sample indicates a preference for chick buying on the part of medium and larger producers in most districts. These observations are biased, however, because smallholders produce mainly local varieties and most of the observed chick producers do not sell these. Thus the results for commercial chick farm clients misrepresent the composition of the chick and chicken industry.

**Table 32:** Size of farm clients

District	Backyard <50 head	Small 50-200 head	Medium 201-1,000 head	Large >1,000 head	Don't know size
Soc Son	73%	28%	0%	0%	0%
Tu Liem	0%	20%	30%	50%	0%
Hoai Duc	0%	19%	68%	13%	0%
Phu Xuyen	26%	49%	15%	4%	5%
Dong Anh	5%	10%	35%	50%	0%
Yen Phong	0%	60%	10%	30%	0%

### **Contractual Relations**

For all but the largest producers, informal contracts dominate the commercial chick industry. Discounts appear to be a consistent feature of informal contracts, with over half of chick producers reporting them for some of their clients.

**Table 33:** Number of producers offering discount for regular purchase

VND	Backyard Farms <50 head	Small Farms 50-200 head	Medium Farms 201-1,000 head	Large Farms >1,000 head	Traders
Other	1	0	1	1	0
10 – 50	0	0	1	1	8
51 – 200	1	2	3	2	7
201 - 500	0	0	0	0	2

There appears to be some degree of competition in the commercial chick sector, with most customers reporting more than one source for chicks.

**Table 34:** Proportion (%) of customers with only one chick supplier

District	Backyard Farms <50 head	Small Farms 50-200 head	Medium Farms 201-1000 head	Large Farms >1,000 head	Traders
Soc Son	31%	60%			12%
Tu Liem			100%	10%	
Hoai Duc			37%	15%	29%
Phu Xuyen	43%	44%			
Dong Anh					
Yen Phong		25%	40%	100%	

Most districts report multiple suppliers with similar capacity, but it should be recalled this only represents crossbred and industrial varieties. For local varieties, farmers may have more sources, but also be bound by neighbour and commune relationships that limit competition.

### ***Safety Inspection of Farms***

The current inspection regime for chick producers appears to be very irregular in execution and incomplete in its coverage.

**Table 35:** Number of safety inspections per year

District	Mean	S.D.
Soc Son	6	8
Tu Liem	365	-
Hoai Duc	3	1
Phu Xuyen	11	10
Dong Anh	30	-
Yen Phong	12	-

Reported costs of inspection appear relatively high, amounting to more than 10% of reported retail prices for most birds and districts. This could pose a significant deterrent to inspection program conformity.

### ***Other Poultry Activities***

This sample included a significant minority of producers who were diversified toward other poultry varieties, especially Muscovy and standard ducks. In some districts egg selling was highly integrated with chick production, while in others it was linked to breeding stock development and marketing. Other non-chick activities included slaughterhouse services (in Dong Anh) and upstream lending.

## **2.3 Commune Trader Survey**

This survey covered local traders operating in the same communes as the commune farmer survey. Traders were interviewed on the same day as the farmer survey with an aim for full coverage and equal focus on 'roving traders' and traders serving local markets. The survey target was set at 10 traders per commune, but the actual number has varied because of local circumstances. A total of 66 traders were interviewed.

**Table 36:** Commune traders visited

District	Observations	Percent
Gia Binh	12	18
Tien Du	7	11
Ly Nhan	5	8
Kim Bang	12	18
Soc Son	11	17
Tu Liem	2	3
Hoai Duc	7	11
Phu Xuyen	10	15

### Commune Trader Characteristics

Most traders seem to spend less than one third of their time collecting chicken. Local traders obtain most of their chicken directly from farms, and have permanent marketplace spaces.

**Table 37:** Proportion (%) of time spent on purchasing and selling

Activity	Obs.	Mean	S.D.	Min.	Max.
Selling from permanent stall	52	72	14	40	95
Selling from temporary stall	14	65	20	10	90
Collecting chicken from farms	65	28	14	5	60
Collecting chicken from other places	66	2	9	0	60

As with other agricultural products (including chicks above), the motorcycle is the primary means of conveyance of commune chicken traders. No commune traders reported using trucks.

**Table 38:** Method of collecting chicken

District	Motorcycle	Bicycle	Other
Gia Binh	37%	63%	0%
Tien Du	100%	0%	0%
Ly Nhan	100%	0%	0%
Kim Bang	50%	50%	0%
Soc Son	54%	44%	3%
Tu Liem	90%	10%	0%
Hoai Duc	56%	44%	0%
Phu Xuyen	89%	11%	0%
Total	0%	0%	0%

There is significant variation in experience across this specialization. In some districts, commune traders average over a decade of experience, while in others it is 6-7 years. This may be due to market emergence in the wake of economic reforms and infrastructure development, indicating a growth process that can be leveraged for more extensive rural poverty alleviation.

**Table 39:** Years of experience trading chicken

District	Mean	S.D.
Gia Binh	14	9
Tien Du	7	3
Ly Nhan	7	4
Kim Bang	12	7
Soc Son	13	7
Tu Liem	6	4
Hoai Duc	13	11
Phu Xuyen	9	6

For most commune traders, chicken is not the primary source of household income. This indicates the existence of diversification strategies to smooth income, but also suggest this market is ripe for enlargement or consolidation.

**Table 40:** Percent of income from chicken trading

District	Mean	S.D.
Gia Binh	16	8
Tien Du	22	10
Ly Nhan	12	10
Kim Bang	15	6
Soc Son	42	29
Tu Liem	33	4
Hoai Duc	13	4
Phu Xuyen	26	21

Unlike farming activities commune chicken trading is a predominantly female profession, with mature (middle aged) women making up the majority of traders. This fact further reinforces the impression that this is a secondary household income activity, making it important to economic security and suggesting capacity for expansion.

**Table 41:** Gender and age of traders

Gender	Obs.	Age	Obs.
Male	7	<35	5
Female	53	35-45	30
		>45	31

### **Chicken Sales**

On average, most commune traders deal in 100-200 chickens per week, indicating that small operators dominate this specialty and reinforcing its importance as a low income enterprise activity.

**Table 42:** Chickens traded per week

District	Mean	S.D.	Min.	Max.
Gia Binh	197	66	100	360
Tien Du	164	90	70	300
Ly Nhan	100	31	70	140
Kim Bang	148	35	100	210
Soc Son	165	63	90	300
Tu Liem	165	21	150	180
Hoai Duc	121	49	70	210
Phu Xuyen	185	134	50	450

Trader operations are dominated by the same seasonality as other parts of the Viet Nam chicken supply chain. Sales increase for most traders before and during the Tet season. During the fall some traders also increase sales.

**Table 43:** Increase in sales during peak demand periods

Month	Gia Binh	Tien Du	Ly Nhan	Kim Bang	Soc Son	Tu Liem	Hoai Duc	Phu Xuyen
January	75%	43%	0%	67%	64%	0%	100%	60%
February	42%	29%	40%	42%	18%	0%	0%	20%
March	0%	29%	40%	42%	36%	0%	0%	20%
April	0%	0%	0%	0%	18%	0%	0%	0%
May	0%	0%	20%	0%	0%	0%	0%	0%
June	8%	0%	20%	0%	0%	0%	0%	0%
July	8%	0%	0%	0%	0%	0%	0%	0%
August	17%	0%	0%	0%	9%	0%	14%	10%
September	25%	57%	20%	8%	18%	0%	29%	30%
October	8%	57%	20%	17%	9%	0%	14%	30%
November	17%	0%	20%	25%	18%	100%	0%	0%
December	67%	43%	20%	25%	27%	100%	57%	60%

As might be expected, local traders tend to operate at the district level, but in some areas go to other districts within their provinces as well as other provinces.

**Table 44:** Location of farms where chicken is sourced

District	Commune	District	Own Province	Other Province
Gia Binh	17%	83%	0%	0%
Tien Du	0%	43%	40%	17%
Ly Nhan	0%	100%	0%	0%
Kim Bang	0%	92%	8%	0%
Soc Son	54%	37%	1%	9%
Tu Liem	0%	50%	0%	50%
Hoai Duc	0%	83%	17%	0%
Phu Xuyen	0%	42%	50%	8%

At the time of this survey commune traders were a leading downstream outlet for smallholder producers (see previous section). This relationship is symbiotic, as commune traders rely on small producers for the vast majority of their trading stock. Again we see linkages between the poor across the food value chain.

**Table 45:** Size of farms where chicken are sourced

District	Backyard <50 head	Small 50-200 head	Medium 201-1,000 head	Large >1,000 head
Gia Binh	62%	25%	11%	2%
Tien Du	26%	36%	29%	0%
Ly Nhan	0%	28%	72%	0%
Kim Bang	52%	38%	10%	0%
Soc Son	67%	18%	15%	0%
Tu Liem	100%	0%	0%	0%
Hoai Duc	27%	20%	53%	0%
Phu Xuyen	37%	17%	4%	0%

Because of their primary reliance on smallholder producers, commune traders tend to specialize in local or traditional chicken breeds. Like smallholder farmers, they are participating in a specialty market with premium price characteristics, and they probably have significant product and market specific expertise related to these more locally adapted product varieties.

**Table 46:** Breed of chicken traded

District	Local	Crossbred	Other
Gia Binh	83%	7%	10%
Tien Du	67%	0%	33%
Ly Nhan	0%	12%	88%
Kim Bang	81%	4%	15%
Soc Son	90%	4%	5%
Tu Liem	100%	0%	0%
Hoai Duc	47%	14%	39%
Phu Xuyen	70%	1%	29%

The usual price advantages for local chicken are apparent in commune trader responses, including significant variance because of diverse local conditions and high relative transport costs.

**Table 47:** Average year-round prices by breed and district (VN Dong)

District	Local		Crossbred		Industrial	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Gia Binh	40,455	1,508	34,000	8,485	27,000	
Tien Du	47,000	2,739			28,000	
Ly Nhan			30,000		27,600	1,817
Kim Bang	46,583	1,975	31,667	2,887	27,333	577
Soc Son	44,300	4,084	37,000		27,000	
Tu Liem	55,000					
Hoai Duc	46,600	2,302	38,333	2,887	29,500	1,000
Phu Xuyen	48,571	5,563	30,000		27,667	577

**Table 48:** Peak demand period prices by breed and district (VN Dong)

District	Local		Crossbred		Industrial	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Gia Binh	50,909	6,640	38,500	9,192	33,000	
Tien Du	65,000	3,536			32,500	3,536
Ly Nhan			38,000		32,800	2,168
Kim Bang	61,583	2,575	38,667	4,163	31,333	1,155
Soc Son	52,100	17,848	42,000		33,000	
Tu Liem	75,000					
Hoai Duc	60,000	6,124	44,000	1,732	32,500	577
Phu Xuyen	61,429	6,268	40,000		32,667	577

The usual seasonality is also apparent in intermediary chicken prices, but local varieties have a much higher scarcity premium. This presumably relates to their specific suitability for festival consumption and lower supply elasticities (longer growing period, higher unit transport costs, etc.). Industrial chicken prices seem to increase 5,000 VN Dong/kg during high price periods, while they increase 10,000-20,000 VN Dong/kg for local chicken.

As might be expected given their scale, commune traders source and sell most of their chickens locally. Sales in particular are dominated by commune customers, and virtually all commune trader chicken is sold within individual districts.

**Table 49:** Destination of chicken sales

District	Commune	District	Province	Other Province
Gia Binh	58%	42%	0%	0%
Tien Du	100%	0%	0%	0%
Ly Nhan	100%	0%	0%	0%
Kim Bang	8%	92%	0%	0%
Soc Son	28%	66%	5%	0%
Tu Liem	100%	0%	0%	0%
Hoai Duc	57%	14%	29%	0%
Phu Xuyen	60%	30%	0%	10%

These traders also sell nearly all their chickens to household final consumers. For this reason, they provide direct linkage across the 'poor economy' carrying products to and from low income households. To clearly identify the potential for value upgrading, it would be necessary to re-sample this population and trace chickens to determine the income distribution of buyers from commune traders. It is apparent from the seasonal data that all households generally pay more for chickens at festival time, but it is not yet clear that higher prices could be sustained in the downstream markets of commune traders.

It will be essential to identify this if commune traders are to participate in quality upgrading programs. If, on the other hand, low incomes in their destination market give these traders an incentive to commoditize chicken and drive down producer prices, they may be contributing to adverse selection.

**Table 50:** Customers of commune traders

District	Consumers	Restaurants	Shops	Traders	Other
Gia Binh	95%	0%	5%	0%	0%
Tien Du	91%	0%	3%	0%	6%
Ly Nhan	99%	0%	1%	0%	0%
Kim Bang	85%	0%	15%	0%	0%
Soc Son	83%	6%	7%	4%	0%
Tu Liem	98%	0%	3%	0%	0%
Hoai Duc	99%	0%	1%	0%	0%
Phu Xuyen	63%	11%	16%	10%	0%

### ***Safety Certification***

The unit cost of safety certification remains relatively high, averaging over 10% of trader prices. It is also a regressive producer tax, since unit certification costs are higher for smallholders and small traders. Commune veterinary fees are nearly double those of district veterinarians, who are more costly to visit. Both these characteristics are important deterrents to more complete coverage of health inspection and certification systems, and the latter undermines national objectives for poverty alleviation.

## **2.4 Wholesale Trader Survey**

This survey took place in the two wholesale poultry markets serving Ha Noi: Bac Thang Long and Ha Vi. The survey focused on areas not covered by previous surveys: prices, nature of contractual relations, value-added components of pricing, and source of safety certification. Assistance of market inspectors ensured that all selected traders participated in the survey.

In Bac Thang Long market, traders entered the market between 1 a.m. to 6 a.m. Two enumerators were posted at the entrance and interviewed every other trader entering the market, for a total of 20 interviews. This is 50 percent coverage from the estimated number of traders entering the market on a weekend night, as indicated by the market inspector. A weekend night was selected because weekends are busier and coverage would hence be greater.

In Ha Vi market, two enumerators also stood at the market entrance and interviewed traders entering the market. The interviews had to be conducted over a few days, because traders enter Ha Vi at all times of the day, which allowed for full coverage. Hence the 39 observations covered almost all traders operating at Ha Vi during this time of the year (summer). The local veterinarians stated that (1) flow of traders is the same during the week/weekend and that (2) the number of traders might at least double during the Tet season.

Inside Ha Vi market, there are several traders operating that had been previously identified as 'aggregators'. They typically buy from the traders entering the market and sell to slaughterhouses, as well as other businesses. After visiting Ha Vi market and meeting with market authorities, it was determined that the 'Wholesale Trader Survey' would be more appropriate for this group. Twenty-five of these traders were interviewed.

The survey was also given to 3 traders in Tien Du district that met the description of wholesale traders. The total number of observations for this survey is 88.

### Wholesale Trader Characteristics

Below is the self-described 'main role' of the traders that were interviewed. Ha Vi 1 refers to the traders that were interviewed at the market entrance and Ha Vi 2 refers to the traders (middleman/aggregators) that were interviewed inside of the market.

**Table 51:** Wholesale trader 'role' by market

'Main Role of Trader'	Bac Thang Long	Ha Vi 1	Ha Vi 2	Tien Du
Deliver chickens to market	19	34	0	3
Buy chicken inside market	1	6	25	0

Traders in the surveys have comparable average trading experience of between 7 and 9 years, with a minimum of two years. Some of the interviewed traders have been operating for 20 years.

**Table 52:** Head of chicken traded on the survey day

Market / Survey	Mean	Min.	Max.
Bac Thang Long	100	50	200
Ha Vi 1	587	100	2,200
Ha Vi 2	626	200	1,900
Tien Du	203	120	280

Traders in Ha Vi have much larger operations than those operating in the other two markets.

**Table 53:** Age and gender of market wholesalers

Gender	Bac Thang Long	Ha Vi 1	Ha Vi 2	Tien Du
Male	15	26	16	2
Female	5	14	9	1
Age				
<35	1	7	2	0
35-45	18	27	17	1
>45	1	6	6	2

### Chicken Sources

Farms are the most common source of chicken for wholesale traders with the exception of those interviewed in the Ha Vi 2 survey, which primarily came to the market to purchase chicken for onward sale / processing.

**Table 53:** Chicken suppliers of wholesalers

Market / Survey	Farmer	Other Traders	Markets	Company
Bac Thang Long	99%	1%	0%	0%
Ha Vi 1	83%	2%	0%	13%
Ha Vi 2	32%	50%	0%	18%
Tien Du	100%	0%	0%	0%

**Table 54:** Contractual relationships with suppliers

Market / Supplier	None	Verbal	Formal
<b>Bac Thang Long</b>			
Farms	45%	55%	0%
<b>Ha Vi 1</b>			
Farms	6%	71%	26%
Traders	0%	100%	0%
Company	0%	0%	100%
<b>Ha Vi 2</b>			
Farms	0%	58%	42%
Traders	0%	94%	6%
Company	0%	0%	100%
<b>Tien Du</b>			
Farms	0%	100%	0%

For wholesalers, having no agreement for supply is rare, except between Bac Thang Long traders and farmers. Traders from Ha Vi tend to have more formal agreements, which are more common with farms.

### **Chicken Breeds and Prices**

Mostly local chicken are traded in Ha Vi and Tien Du, while in Ha Vi there is more trade in crossbred and industrial chicken.

**Table 55:** Breeds traded by wholesalers

Market / Survey	Local	Crossbred	Industrial	'Egypt'
Bac Thang Long	55%	5%	30%	10%
Ha Vi 1	26%	24%	47%	3%
Ha Vi 2	13%	44%	43%	0%
Tien Du	87%	13%	0%	0%

Prices are similar across markets, with the traders inside Ha Vi, as expected, receiving higher prices.

**Table 56:** Average year-round wholesale chicken prices (VN Dong)

Market / Survey	Local		Crossbred		Industrial.		'Egypt'	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Bac Thang Long	48,909	5,770	45,000	-	23,500	1,517	40,000	-
Ha Vi 1	48,462	2,332	34,542	4,480	23,250	1,334	38,000	-
Ha Vi 2	58,800	1,789	37,692	2,869	24,167	1,008	-	-
Tien Du	50,667	4,041	38,000	-	-	-	-	-

**Table 57:** High demand period chicken prices (VN Dong)

Market / Survey	Local		Crossbred		Industrial.		'Egypt'	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Bac Thang Long	40,000	2,898	39,000	-	20,167	1,329	34,500	707
Ha Vi 1	40,385	1,805	28,917	3,919	17,409	1,563	28,000	-
Ha Vi 2	47,200	2,588	29,692	4,049	16,833	1,642	-	-
Tien Du	42,333	2,517	32,000	-	-	-	-	-

The wholesale traders interviewed generally sell to other traders. Many also sell directly to slaughterhouses.

**Table 58:** Wholesale trader customers

Market / Survey	Traders	Slaughterhouses	Shops	Consumers	Markets
Bac Thang Long	5%	92%	2%	0%	2%
Ha Vi 1	67%	22%	1%	1%	8%
Ha Vi 2	76%	13%	6%	5%	0%
Tien Du	60%	0%	18%	2%	20%

Very few traders have formal relationships with customers. Informal contracts are the most common, and distribution varies widely by market.

**Table 59:** Contractual relationship with customers

Market / Survey	None	Verbal	Formal
<b>Bac Thang Long</b>			
Traders	0%	100%	0%
Slaughterhouses	42%	58%	0%
Shops	0%	100%	0%
Markets	0%	100%	0%
<b>Ha Vi 1</b>			
Traders	9%	85%	6%
Slaughterhouses	31%	62%	8%
Shops	100%	0%	0%
Consumers	67%	33%	0%
Markets	9%	91%	0%
<b>Ha Vi 2</b>			
Traders	20%	80%	0%
Slaughterhouses	36%	64%	0%
Shops	17%	83%	0%
Consumers	82%	18%	0%
<b>Tien Du</b>			
Traders	67%	33%	0%
Shops	0%	100%	0%
Consumers	100%	0%	0%
Markets	0%	100%	0%

## Safety Certification

For market wholesalers, most safety certificates were obtained in the province where the market is located, although chicken are sourced from several provinces.

**Table 60:** Safety certification cost (VN Dong per trip / consignment)

Market / Survey	Mean	S.D.	Min.	Max.	Freq.
Bac Thang Long	18,263	26,905	2,000	120,000	19
Ha Vi 1	36,346	53,534	2,000	200,000	26
Ha Vi 2	44,688	58,371	5,000	200,000	16
Tien Du	17,500	10,607	10,000	25,000	2

Certification cost varies widely by trader type, and may be related to trade volume.

## 2.5 Slaughterhouse / -facility Survey

The slaughterhouse / -facility survey included slaughterhouse operators serving Ha Vi Wholesale Market and Bac Thang Long wholesale market, the two chicken wholesale markets serving Ha Noi. The survey also included registered (usually larger/modern, serving a larger market) slaughterhouses two of the districts visited for farmer surveys. At Bac Thang Long Wholesale Market, all slaughterhouse operators (16) were interviewed. 100 percent participation was achieved due to the assistance of the market inspector. The slaughterhouse operators were interviewed on site by enumerators in the early morning, after all traders had arrived. In Ha Vi Wholesale Market, there are about 350 slaughterhouse / -facilities and 60 operators were selected to be interviewed based on random numbers generated by STATA. The selected slaughterhouse operators were invited to the commune meeting hall to take the survey. Despite an expected refusal rate of approximately 15 percent, all slaughterhouse operators invited participated in the survey. The registered slaughterhouse / -facility operators and breakdown of surveys is shown in the table below. Total number of observations is 79.

**Table 61:** Slaughterhouse sample locations

Location	Observations
Bac Thang Long Market (Ha Noi)	16
Ha Vi Market (Ha Tay)	60
Soc Son district (Ha Noi)	1
Tu Liem district (Ha Noi)	2

### Slaughterhouse Operator Characteristics

The slaughterhouses in Bac Thang Long market are located inside of a wholesale market. By contrast, the slaughterhouses / -facilities in Ha Vi market and Soc Son district are located in households. The slaughterhouses in Tu Liem district are free-standing facilities.

**Table 62:** Years of operation

Location	Mean	S.D.
Bac Thang Long	14	9
Ha Vi	7	4
Soc Son	6	-
Tu Liem	1	0
Total	8	6

The slaughterhouses sampled here were processing chickens as part of a larger diversified household enterprise. Chicken product income was more than half of total household income in only one locale.

**Table 63:** Contribution (%) of chicken slaughter to household income

Location	Mean	S.D.
Bac Thang Long	20	10
Ha Vi	24	15
Soc Son	40	-
Tu Liem	65	49
Total	25	17

One slaughterhouse operator reported raising broilers, while another reported operating a wholesale market stall. Generally, however, slaughterhouse operators are not involved in other aspects of poultry production and marketing.

**Table 64:** Gender of interview participants

Gender	Obs.	Age	Obs.
Male	44	<35	13
Female	35	35-45	30
		>45	36

### **Chicken Supply**

In Bac Thang Long, most chicken are delivered by a trader. In Ha Vi market, most chicken are sourced in a wholesale market. Many slaughterhouses also source directly from farms.

**Table 65:** Source of chicken for slaughter

Location	Directly from a farm	Directly from a market	Directly from a non-market trader	Delivered by a Trader	Company
Bac Thang Long	13%	0%	0%	88%	0%
Ha Vi	3%	97%	0%	0%	0%
Soc Son	0%	0%	0%	20%	80%
Tu Liem	25%	0%	0%	0%	75%
<b>Total</b>	<b>5%</b>	<b>74%</b>	<b>0%</b>	<b>18%</b>	<b>3%</b>

Slaughterhouses rarely have contracts with farmers, but often have verbal agreements with traders who deliver chicken. Most slaughterhouses in Ha Vi have verbal contracts with their suppliers. The slaughterhouse in Soc Son has a verbal contract with farmers and both verbal and written contracts with the company it works with. Companies are generally firms such as Phuc Thin or CP.

**Table 66:** Contractual relationships with suppliers

Location & Supplier	None	Verbal	Formal
<b>Bac Thang Long</b>			
Farmers	83%	17%	0%
Traders (delivered)	25%	81%	0%
<b>Ha Vi</b>			
Farmers	0%	100%	0%
Market	2%	98%	0%
<b>Soc Son Slaughterhouse</b>			
Traders (delivered)	0%	100%	0%
Company	0%	100%	100%
<b>Tu Liem Slaughterhouse</b>			
Farmers	0%	100%	0%
Company	0%	0%	100%

Slaughterhouses in Bac Thang Long and Ha Vi generally work with small to medium farms. The slaughterhouse in Tu Liem works primarily with large farms.

### ***Chickens Slaughtered***

BTL slaughters more than 50% local chicken, while the other slaughterhouses tend to specialize in crossbred and industrial chicken.

**Table 67:** Types of chicken slaughtered

Location	Local	Cross	Industrial
Bac Thang Long	56%	14%	27%
Ha Vi	14%	37%	48%
Soc Son	20%	0%	80%
Tu Liem	20%	25%	55%
<b>Total</b>	<b>23%</b>	<b>32%</b>	<b>45%</b>

**Table 68:** Weekly chicken and other poultry slaughter

Location	Head Chicken Slaughtered / Week	S.D.	Head Other Poultry Slaughtered / Week	S.D.
Bac Thang Long	881	343	836	524
Ha Vi	148	82	103	123
Soc Son	500	-	0	-
Tu Liem	17,500	14,849	0	-
<b>Total</b>	<b>740</b>	<b>3,214</b>	<b>2,51</b>	<b>393</b>

Ha Vi market slaughterhouses appear to be small family operations, while the others are larger businesses.

### **Chicken Sales**

The seasonal poultry cycle in Viet Nam affects individual slaughter houses somewhat differently. Ha Vi and Soc Son slaughterhouses seem to increase sales most during Tet whereas Bac Thang Long slaughterhouses tend to increase sales during December. Tu Liem market does not register seasonal peaks in sales. To ascertain the reasons for these variations would require more detailed survey activity.

**Table 69:** Increase in slaughterhouse sales by month

Month	Bac Thang Long	Ha Vi	Soc Son	Tu Liem	Total
January	3%	15%	0%	0%	12%
February	0%	39%	60%	0%	31%
March	0%	2%	0%	0%	1%
April	0%	0%	0%	0%	0%
May	0%	0%	0%	0%	0%
June	0%	0%	0%	0%	0%
July	0%	7%	0%	0%	5%
August	3%	2%	0%	0%	2%
September	3%	1%	0%	0%	1%
October	0%	0%	0%	0%	0%
November	0%	6%	0%	0%	4%
December	18%	3%	0%	0%	5%

Most of the slaughterhouses surveyed have reasonable diversification in their downstream customer pools.

**Table 70:** Slaughterhouse customers

Location	Traders	Shops / Retailers	Consumers	Other
Bac Thang Long	50%	47%	3%	0%
Ha Vi	0%	23%	74%	2%
Soc Son	0%	70%	30%	0%
Tu Liem	0%	90%	10%	0%
<b>Total</b>	<b>10%</b>	<b>30%</b>	<b>58%</b>	<b>2%</b>

As was apparent from the trader and consumer surveys, slaughterhouse operators rely primarily on informal contracts for sourcing animals and delivery to customers. This approach offers flexibility, but makes surveillance and *ex post* analysis more difficult. In some markets no prior agreements regulate market flows. This must create uncertainty and reduce efficiency in the use of processing capacity, but there are presumably advantages to these informal arrangements not obvious to outside observers.

**Table 71:** Contractual relationships with customers

Location / Customer	None	Verbal	Formal
<b>Bac Thang Long</b>			
Traders	13%	53%	20%
Consumers	67%	33%	0%
Shops	8%	33%	67%
<b>Ha Vi</b>			
Traders	0%	100%	0%
Consumers	19%	79%	0%
Shops	13%	84%	0%
Retailers	0%	100%	0%
<b>Soc Son</b>			
Consumer	0%	100%	0%
Shops	0%	100%	0%
Retailers	0%	100%	0%
<b>Tu Liem</b>			
Consumers	0%	100%	0%
Shops	50%	50%	50%

In contrast to other poultry market strata, average prices are similar across slaughterhouses. This suggests a reasonable degree of competitiveness and mobility for both buyers and sellers to these intermediaries.

**Table 72:** Average year-round prices per kg by chicken type

Location	Local		Crossbred		Industrial	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Bac Thang Long	60,467	7,049	36,857	6,744	27,889	3,621
Ha Vi	59,927	6,202	38,340	4,489	29,019	2,005
Soc Son	60,000	-	-	-	27,000	-
Tu Liem	80,000	-	-	-	39,000	-

Despite this apparent competitiveness, however, slaughterhouses appear to capture a significant premium during high poultry price cycles.

**Table 73:** High demand period prices per kg by chicken type

Location	Local		Crossbred		Industrial	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Bac Thang Long	71,333	11,437	43,429	5,412	32,111	4,457
Ha Vi	69,951	7,720	44,472	5,507	34,315	2,054
Soc Son	70,000	-	-	-	30,000	-
Tu Liem	80,000	-	-	-	39,000	-

Furthermore, about half of the slaughterhouse operators report some degree of price discrimination by customer, further suggesting the presence and exercise of monopoly power.

### ***Safety Inspection and Certification***

Most slaughterhouse operators do not charge a premium for delivery or safety certification. Most slaughterhouses claim that birds have a safety certificate on arrival.

**Table 74:** Slaughterhouse operators and percentage of birds that have a safety certificate on arrival to slaughterhouse

Location	Percentage of safety certified birds		
	80%	90%	100%
Bac Thang Long	0	0	16
Ha Vi	4	1	55
Soc Son	0	0	1
Tu Liem	0	0	2
<b>Total</b>	<b>4</b>	<b>1</b>	<b>74</b>

Most slaughterhouses have their facilities inspected, but there is only a charge for this in Bac Thang Long market. Ha Vi is the only market where slaughtered birds are not inspected on-site.

## **2.6 Live Bird Market Vendor Survey**

Market vendors are private retail sellers of poultry, providing animals and meat to households and enterprise end users from formal premises. The market vendor survey was conducted in the inner districts of Ha Noi. Separately, consumer survey results showed that approximately 80 percent of consumers shop for chicken meat in markets (wet markets). The other 20 percent included corner shops, mobile poultry meat traders (selling from a basket), supermarkets, home delivery sales systems, and visiting the countryside. The current survey was focused on wet markets to conserve cost, but more detailed research should include these alternate market channels.

### ***Sampling Strategy***

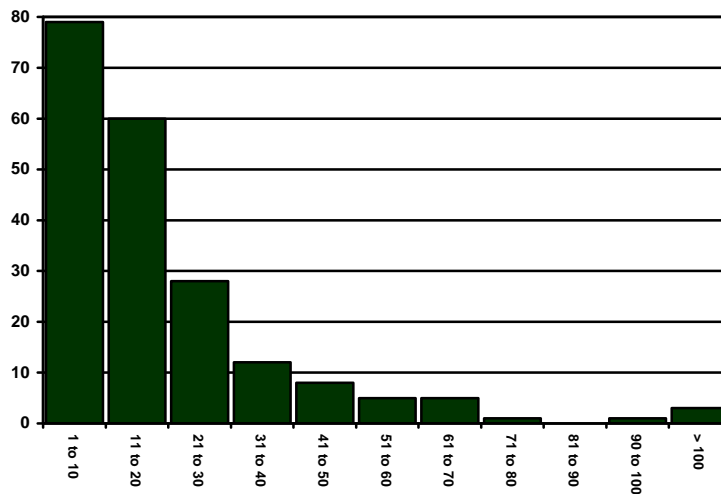
The total number of market vendors to be interviewed was set at 200, with the number assigned to each district being set proportional to population size. Sub-districts were ranked in ascending order based on uniformly distributed random numbers generated by statistical software (STATA). Enumerators visited sub-districts in this randomized order and identified the number of chicken vendors in the sub-district market. Enumerators also randomly selected the vendors to be interviewed, although this was rarely necessary. Up to 5 vendors were interviewed in each market, with the number interviewed per market often being less due to a refusal rate of 30% and small numbers of chicken vendors being present in most markets. In all, 200 interviews were conducted, with the breakdown by district shown below. Often a few sub-districts share a market, indicating that vendors interviewed represented well over half of all chicken vendors operating in Ha Noi.

**Table 75:** Location of vendor interviews

District	Observations	% Sub-districts Covered
Ba Dinh	24	50
Cau Giay	12	38
Dong Da	36	38
Hai Ba Trung	33	45
Hoan Kiem	18	33
Hoang Mai	22	36
Long Bien	17	36
Tay Ho	11	38
Thanh Xuan	27	82

### ***Vendor Characteristics***

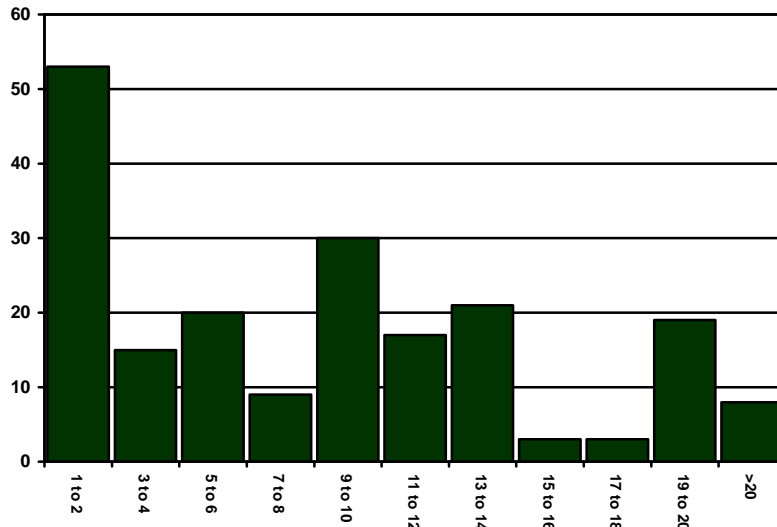
Market vendors are predominantly small, low-income independent operators who sell less than 50 chickens per day. This is one of the most salient characteristics of the Ha Noi food supply chain, which links small individual agents from the farm gate to the consumer. Larger agro-food intermediaries are largely absent in market during the survey. While they are beginning to appear in middle and upper income market segments, the current system provides independent livelihoods to a large and diverse population of lower income individuals.

**Figure 2:** Daily chicken sales per vendor

Most vendors have significant personal experience in the markets, with a median value of about a decade. Given the relatively brief period since market reforms began in Viet Nam, this is a well established market profession. Most vendors are middle aged women (97%) and nearly 80 percent occupy permanent market premises. The dominant position of women indicates that they are providing essential supplemental household income, beyond their child bearing years, and

their business probably also contributes to household food security. These vendors are well established in a web of contractual relationships and transition to other economic activities would be difficult for them and their families.

**Figure 3:** Years of vendor experience selling chicken



Vendors usually operate from a permanent market stall (79%) and frequently sell other types of poultry (77%) while sale of other meat is relatively rare (7%).

Sales across the year are steady with the notable exception of winter festival intervals, particularly the Tet holiday. Average sales increase quite sharply during the January-February interval, but so does variance of sales, indicating that a significant percentage of vendors are unable to expand capacity to meet this cycle. More detailed research would be needed to identify the constraints they face, as well as the important issue of varietal choice and other determinants of willingness to pay during this period. It is well known that premium prices are paid for poultry during these periods, but without more detailed surveys it is not possible to decompose scarcity and varietal components of these higher prices. What is apparent from the variance estimate is that many vendors are missing a premium revenue opportunity.

**Table 76:** Seasonality in live bird sales

Month	% Increase	S.D.	Max.	Month	% Increase	S.D.	Max.
January	52	127	700	July	0	4	50
February	21	105	1,000	August	2	18	250
March	2	7	50	September	1	4	30
April	0	2	30	October	2	7	50
May	0	2	20	November	7	31	400
June	0	1	10	December	6	12	60
August	2	18	250	August	2	18	250

Live chicken vendors were present in most of the markets visited, and there appears to be a distinct specialization in selling live chicken. Two thirds of live bird vendors sell only live chicken. This implies that policies targeted toward live bird supply chain management, including training, certification, contracting, etc., can be focused.

**Table 77:** Proportion of live chicken sales

% Chicken Sold Live	Number of Vendors Selling Live Chicken by District					Total
	Dong Da	Hoan Kiem	Hoang Mai	Long Bien	Tay Ho	
100%	1	0	4	7	0	12
70%	0	1	1	0	0	2
30%	0	0	0	1	0	1
20%	0	0	0	0	1	1
10%	0	0	0	1	1	2

Poultry variety is a very important characteristic of the Ha Noi market. The companion consumer survey indicated that household buyers at all income levels are very discerning about poultry and poultry products. They exhibit distinct preferences for fresh meat from local varieties, and are willing to pay substantial premia for this. In response to these demand-side forces, vendors devote 59% of their inventory to local bird types, 32% to industrial chicken, and 9% to crossbred birds.

The distribution of varieties across all three buyer types is close to the average, as is the variety portfolio of vendors. The tiny share of crossbreeds indicates some kind of bifurcation in the buying side of the market. Consumer respondents indicated that industrial birds were less tasty but more easily masticated and thus appropriate for elder people. More detailed surveys would be needed, however, to identify varietal preferences within these three buyer groups.

**Table 78:** Vendor distribution by buyer type and breed of chicken

Vendors	Local		Crossbred		Industrial		Total	
	Obs.	%	Obs.	%	Obs.	%	Obs.	%
Households	179	51	56	16	119	34	354	100
Restaurants	39	54	8	11	25	35	72	100
Shops	51	43	21	18	47	39	119	100
<b>Total / Average</b>	<b>269</b>	<b>49</b>	<b>85</b>	<b>16</b>	<b>191</b>	<b>35</b>	<b>545</b>	<b>100</b>

One of the most important findings of these surveys has been the size and consistency of the price premium paid for local, traditional, or backyard poultry varieties. These animals command a regular premium of more than double the price of industrial birds (by equivalent weight). Given economies of scale in large scale poultry, a comparable cost differential is plausible, but the importance of these results is that consumers in a relatively low income urban market are willing to pay double for two thirds of their poultry supply. This is clearly a premium consumer good

across a wide income spectrum, and thus an excellent opportunity for rural participation in urban economic growth.

**Table 79:** Average year-round price (VN Dong / kg) for different chicken types

Type	Obs.	Mean	S.D.	Min.	Max.
Local	178	65,135	10,560	30,000	110,000
Crossbred	55	41,245	10,193	30,000	110,000
Industrial	119	30,534	2,349	25,000	38,000

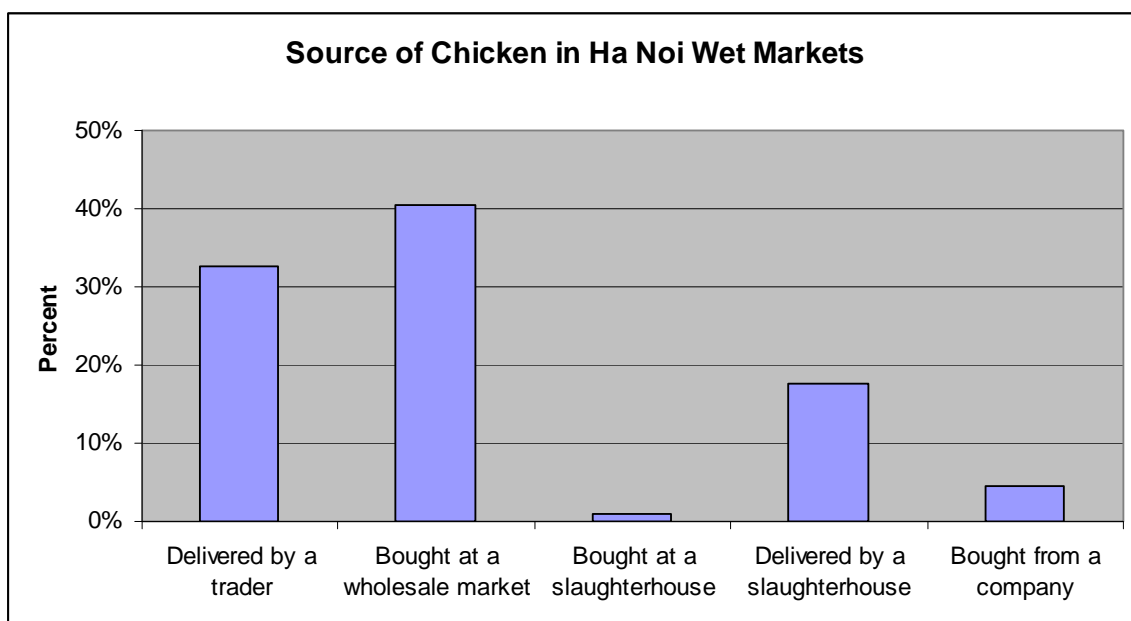
**Table 80:** High demand period price (VN Dong / kg) for different chicken types

Type	Obs.	Mean	S.D.	Min.	Max.
Local	178	76,107	13,433	35,000	130,000
Crossbred	55	48,393	10,668	35,000	120,000
Industrial	119	35,602	2,559	30,000	45,000

### Suppliers

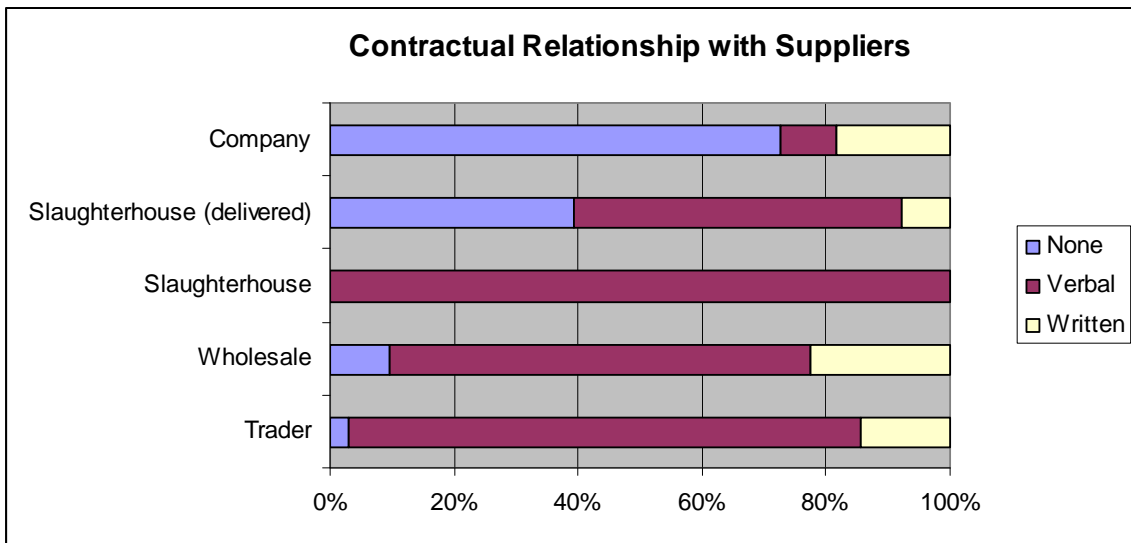
Most vendors in the Ha Noi market obtain their chickens from other individual agents, the latter meeting them in wholesale markets or delivering birds to them at their market premises. Less than 20 percent of the vendors' birds come from slaughterhouses and only 5 percent come from established poultry companies. This ties the health status of retail birds closely to upstream conditions in wholesale markets and individual distribution systems, limiting the role of slaughterhouse surveillance in animal health control.

**Figure 4:** Source of vendor chickens



Vendor relations with suppliers are dominated by informal contracts, with less than 20 percent of all transactions executed with written agreements and a significant majority based on verbal understandings. This further limits the capacity of health authorities to monitor market resource flows and risk transmission, particularly *ex post*, and may contribute to moral hazard in market treatment of animal health status and other quality characteristics. At the same time, informal agreements confer flexibility, lower costs, and other features that appear to make them attractive to market intermediaries. If these features contribute to adverse selection, however, they may prove detrimental to agents at the ends of the supply chain, i.e. farmers and consumers.

**Figure 5:** Vendor supply contracts



The advantages of informal and customary relationships appear more related to agency than to price itself. As the following table indicates, only one quarter of vendor purchases are explicitly discounted for regular purchasing, despite a clear preference for counterpart (i.e. individual) traders and informal agreements. The agency advantages could include consistent supply, timeliness, quality, and other insurance benefits. Delivery is of course an implicit form of discounting, but only more intensive surveying will reveal these detailed contractual features and their role in vendor behaviour.

**Table 81:** Vendor discount for regular purchase

Discount (VN Dong)	Obs.	%
0	141	80
100	6	3
200	14	8
300	3	2
500	7	4
700	1	1
1,000	3	2
2,500	1	1

Most vendors report some type of safety requirement for the chicken they sell, either by stamp or certificate. Of the vendors who reported a stamp requirement, enumerators did not observe a stamp on chicken of 7% of those vendors.

**Table 82:** Vendor stock safety requirements

Safety Requirement	Obs.	Percent
Stamp & Certificate	85	43
Only Certificate	70	35
Only Stamp	38	19
No Regular Inspection	6	3

### ***Relationship with Customers***

Vendors in wet markets are primarily catering to households, who represent almost 90% of their business. On the consumer survey side, we found that most households visit the market daily, buy fresh meat, and are very attentive to quality and safety characteristics.

**Table 83:** Vendor customers

Customer	Percent	S.D.	Min.	Max.
Households	88	21	10	100
Restaurants	6	17	0	90
Shops	6	13	0	80

## **3. Conclusions**

This report summarizes results of six pilot surveys of poultry market participants in and around Ha Noi. In particular, chicken farmers, chick producers, commune traders, wholesalers, slaughterhouses, and retail vendors were surveyed to obtain more detailed understanding of market institutions and interactions. Several salient characteristics are relevant to pro-poor livestock policy.

First, small enterprises owned by low income households have a significant presence at every stage of poultry production, distribution, processing, and marketing. In particular, rural farmers are only one category of poor people who obtain livelihood from participation in this important national food supply chain. Moreover, our evidence indicates that this income is important for households in each category and reflects long established small enterprise experience.

It is also apparent that smallholders specialize in traditional bird varieties, and small enterprise intermediaries in turn handle most of these birds as their main commercial stock. For this reason, policies that affect smallholder poultry producers will likely have strong collateral effects on other

poor households in peri-urban or urban areas. In this way, poverty alleviation strategies targeted at smallholder poultry producers can have multiplier effects and, symmetrically, adverse events for smallholders will multiply regressive income effects through the food supply chain.

Like their production systems, local bird varieties, and the long established consumer preferences for backyard chickens, smallholders and small enterprise intermediaries are deeply embedded in customary traditions. This apparently includes market interactions, which are almost universally governed by informal contracts and verbal agreements. While this approach may have benefits of lower transactions costs and flexibility, it has many disadvantages from both private and public policy perspectives.

In the private context, lack of enforceable contracts or product certification undermines property rights, contributing to moral hazard and adverse selection. The uncertainty that prevails in traditional markets exerts a burden of risk that discounts average product values, undermining incentives to invest in quality or overcome costly barriers to expanded market access. In the context of animal health, these information failures can lead to serious escalation of disease risk and compromise biosecurity and food safety in other ways.

Informal contractual systems make behaviour very difficult to predict, monitor contemporaneously, or reliably analyze *ex post*. All these challenges weaken market or health regulation systems. Simply mandating formal systems, like health certification, is an imperfect solution to this problem, as it may create adverse behaviour such as fraud or concealment. If markets are to be formalized effectively, regulators must find a way to reduce the transactions costs associated with these mechanisms.

Generally speaking, these preliminary results reinforce the importance of understanding how markets affect the livelihoods of the poor, and how market institutions can be improved to increase efficiency, quality, and value for all participants, but especially lower income groups for whom market access is the gateway out of long term poverty.

## 4. Related Research Reports

Hong Hanh P.T, Burgos S., and Roland-Holst D. (2007). *The poultry sector in Viet Nam: prospects for smallholder producers in the aftermath of the HPAI crisis*. FAO-PPLPI Research Report.

Ifft J, Otte J., Roland-Holst D., and Zilberman D. (2007). *Demand Side Approaches to HPAI Risk Reduction*. FAO-PPLPI Research Report.

Otte J., Pfeiffer D., Tiensin T., Price L., and Silbergeld E. (2006). *Evidence-based policy for controlling HPAI in poultry: Bio-security revisited*. FAO-PPLPI Research Report.

- Otte J., Roland-Holst D., Pfeiffer, D. Soares Magalhaes R., Rushton J., Graham J. and Silbergeld, E. (2007). *Industrial Livestock production and global health risks*. FAO-PPLPI Research Report.
- Roland-Holst, D., Otte, J. and Pfeiffer D. (2006). *Initial assessment of the impact of poultry sales and production bans on household incomes in Viet Nam*. FAO-PPLPI Research Report.
- Roland-Holst D., Soares Magalhaes R., Pfeiffer D., Dung D., and Otte J. (2006). *Pilot programme for certified smallholder poultry supply chains for Ha Noi*. FAO-PPLPI Research Report.
- Roland-Holst D., Epprecht M. and Otte, J. (2007). *External shocks, producer risk, and adjustment in smallholder livestock production: The case of HPAI in Viet Nam*. FAO-PPLPI Research Report.
- Soares Magalhaes, R. (2006). *Development of the epidemiological component of SPADA (Strategic Pathogen Assessment for Domestic Animals)*. FAO-PPLPI Research Report.
- Soares Magalhaes, R., Pfeiffer, D., Wieland, B., Dung, D. and Otte J. (2006). *Commune-level simulation model of HPAI H5N1 poultry infection and control in Viet Nam*. FAO-PPLPI Research Report.
- Soares Magalhaes R., Quoc H.D., and Lan L.T. (2007). *Farm gate trade patterns and trade at live poultry markets supplying Ha Noi: Results of a rapid rural appraisal*. FAO-PPLPI Research Report.

## 5. Disclaimer & Contacts

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