The impact of avian influenza on small and medium scale poultry producers in South East Asia (preliminary findings).

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Brief abstract

Preliminary findings of the economic impact of avian influenza on poultry farmers in South East Asia is reported. Total economic losses in Indonesia are estimated at more than US$387 million; in Vietnam direct economic losses are estimated at more than US$200 million. Probit and economic surplus results are pending.

Keywords

Avian influenza; animal health economics; South East Asia; poultry; poverty alleviation.

Introduction

This paper presents preliminary findings of the economic impact of highly pathogenic avian influenza (HPAI) virus on small and medium scale poultry farmers in Cambodia, Indonesia, and Vietnam, based on primary data gathered by the Food and Agriculture Organization (FAO) of the United Nations. The more detailed report based on rigorous analysis will be released as soon as those findings are approved by FAO.

Avian influenza has been identified in poultry for more than a century, although the emergence in South East Asia in 2003 of a previously rarely seen highly pathogenic strain (H5N1) of the HPAI virus was unexpected, resulting in a global veterinary epidemic that continues to spread around the world. By May 2006, HPAI-H5N1 had resulted in the deaths of 127 humans (WHO, 2006) including 42 in Vietnam, 37 in Indonesia, and 6 in Cambodia, and the death or

culling of more than 300 million poultry. Economic losses have been estimated in the several billions of dollars; macroeconomic damage in 2003-2004 has been estimated by the Asian Development Bank and the World Bank to be as much as 3% of GDP (Verbiest and Castillo, 2004; World Bank, 2005).

Of greatest concern to world health experts is the potential for the HPAI-H5N1 virus to mutate into a rapidly spreading strain through human to human contact. At time of writing there are no laboratory confirmed cases of human to human transmission of HPI-H5N1; all transmission to humans has been through bird (or bird fluids) to human contact. Pigs can also be infected by the HPAI-H5N1 virus from birds, and a coincident concern is that overcrowded pig housing with poor sanitation may lead to conditions suitable for mutation of the virus. In conditions where livestock (poultry and pigs in particular) are housed in close contact with each other (both same-species and cross-species contact) and with humans or where markets allow such contact, mutation of the virus to a form that is transmissible between humans is more likely.

The latter scenario, referred to in the popular press as the potential global pandemic of bird flu, has generated fear of widespread disease and death, concern for security of human health, and has prompted governments to develop pandemic flu response scenarios. The virus has not yet been identified in North America, although according to some veterinary experts this is simply a matter of time given the migratory patterns of birds and the concentration of the poultry industry in North America.

Food safety concerns are thus relevant, as are concerns for the cost of controlling and eradicating the disease should the HPAI-H5N1 strain reach North America. Of more immediate interest to production and policy economists is the likely impact of HPAI on the poultry markets and international poultry trade in the United States and Canada. If HPAI-H5N1 does reach North America, there needs to be a realistic plan in place for supporting reconstruction and rehabilitation of the industry, including compensation; this paper thus should be of interest to policy and production economists. US poultry producers in particular are concerned that recent gains in poultry market exports could be lost and not recovered, an issue currently being considered by trade economists.

Background to the study

The Food and Agriculture Organization of the UN implemented a number of Technical Co-Operation Projects (TCP) in South East Asia in response to the HPAI crisis. A regional TCP covering Cambodia, Indonesia, Lao PDR, Thailand and Vietnam was developed and became operational in April 2004 to assist with planning and enacting plans for coincident and post-HPAI sub-sector rehabilitation. Activities undertaken by the project included gathering of what basic economic data were available and fundamental impact studies to clarify the effect on poultry producers. Of particular concern was identification of the needs of producers most affected and most vulnerable to the impact of HPAI. As well, descriptions of the major poultry production systems were addressed and

recommendations were developed for short-term recovery and longer-term rehabilitation.

More than 50% of the rural poor in South East Asia, rely on livestock as their primary source of food and income. In the countries studied annual income is very low (table 1) and the percentage of villagers living in poverty is high in many provinces of the countries studied, surpassing 60-70% in some cases. Poultry are the most accessible form of livestock for the majority of the rural poor, many of whom are landless and use either a backyard scavenging form of livestock management, rental of basic livestock facilities, or share their living quarters with their livestock. While large scale intensive poultry production is present in Indonesia and Vietnam, particularly in peri-urban areas near Jakarta, Hanoi, and Ho Chi Minh, the majority of poultry farmers are small and medium scale producers.

Table 1. Population and income in Cambodia, Indonesia, and Vietnam.

Countries	Human population			
	Millions	People/sq km	Income per caput per annum (US$)	% living in rural areas
Cambodia	13.4	71	280	81.5
Indonesia	238.5	117	710	70.0
Vietnam	82.7	247	430	71.7

Source: After World Development Report, 2004; FAO-Stat, 2005.

Data source and methodology

Data were gathered from more than 1200 small and medium scale poultry producers in Cambodia, Indonesia, and Vietnam as well as middlemen and market sellers, describing various characteristics relevant to farm production,

farmer profile, use of resources, epidemiologic information related to highly pathogenic avian influenza (HPAI) and other diseases, economic and financial indicators, and family demographics.

The data for Cambodia were gathered from the provinces of Phnom Penh, Kandal, Kampong Cham, Takeo and Siem Reap with sampling from 20 commercial farms and 98 backyard farms. Sixteen of the 20 commercial farms reported HPAI infection; the incidence on backyard farms was unknown. A number of middlemen (22), market retailers (22) and service providers (10) were also interviewed.

In Indonesia, data were gathered from five provinces in Java (Banten, West Java, Central Java, Yogyakarta, and East Java) covering 350 farms. The farms were classified as 100 integrated commercial farms, 75 commercial farms with high bio-security, 165 farms with low bio-security, and a small number of backyard farms (10). Interviews were conducted with 30 middlemen, 30 market sellers, and 20 government veterinary officers.

Data in Vietnam were gathered from three provinces (Ha Tay, Thua Thien Hue, and Tien Giang) covering 808 households. Of the farms sampled, 67 were classified as large scale commercial, 476 as commercial with low biosecurity, 112 as small commercial with low biosecurity, 109 as backyard systems, and 44 non-poultry farming households.

Attributes of the different systems of poultry production in the countries studied have been summarized by Dolberg (2005; table 2). An important feature of the classification system referred to in table 2 developed and used by FAO

(2004) in the approach to restructuring of the poultry sectors of affected countries is the categorization of bio-security. Low bio-security systems (sectors 3 and 4) are a much higher risk in maintaining HPAI because of the higher degree of contact with other species including humans, and the difficulty in containing infected premises should disease conditions occur. On the other hand, where sector 1 and 2 farms are infected the economic impact per farm is likely to be greater.

Summary statistics were generated to describe the income, economic losses, costs of recovery, and estimated social impact on communities. Independent probit analysis using the datasets from each country was performed to assess the factors influencing decisions on whether to remain in poultry farming and decisions regarding compensation of producers. Preliminary results are presented in this paper to provide initial information; more rigorous results are pending. Details of country level poultry numbers are included in tables 3 to 5 for reference; further details are in table 6.

Table 2. Characteristics of four different poultry production systems.

Characteristic	**Systems**			
	Industrial	**Commercial**		**Backyard**
	Sector 1	**Sector 2**	**Sector 3**	**Sector 4**
Biosecurity	High	Moderate to high	Low to minimal	Minimal
Marketing system	Commercial	Usually commercial	Birds usually sold in live bird markets	Birds and products consumed locally
Market outputs	Export and urban	Urban/rural	Primarily live urban	Primarily rural
Dependence on market for inputs	High	High	High	Low
Dependence on goods roads	High	High	High	Low
Location	Near capital and major cities	Near capital and major cities	Smaller towns and rural areas	Everywhere. Dominates in remote areas
Birds kept	Indoors	Indoors	Indoors/Part-time outdoors	Out most of the day
Shed	Closed	Closed	Closed/Open	Open
Contact with other chicken	None	None	Yes	Yes
Contact with ducks	None	None	Yes	Yes
Contact with other domestic birds	None	None	Yes	Yes
Contact with wildlife	None	None	Yes	Yes
Veterinary service	Own veterinarian	Pay for veterinary services	Pay for veterinary services	Irregular; rely on government vets
Source – medications	Market	Market	Market	Government and market
Source – technical information	Company and associates	Sellers of inputs	Sellers of inputs	Government extension service
Source – finance	Banks and own	Banks and own	Banks and private	Private and banks
Breed of poultry	Commercial	Commercial	Commercial	Native
Owner food security	High	Good	Fair	Fair to poor

Sources: Dolberg, 2005; FAO, 2004.

Table 3. Number of farms and poultry populations in Cambodia.

System	Number of farms				Population ('000)				Birds per farm	
	Chicken	Duck	Total	%	Chicken	Duck	Total	%	Chicken	Duck
Backyard	1,881,000	380,000	1,900,000	99.94	11,955	2,727	14,682	90.07	6.36	7.18
Commercial										
Broilers	74		74	0.00	379		379	2.32	5,117	
Layers	108		108	0.01	400		400	2.45	3,704	
Duck systems		951	951	0.05		841	841	5.16		884
Hatcheries, parent stock	58	30	88	0.00				0.00		
Cambodia			**1,901,221**	**100.00**			**16,301**	**100.00**		**8.57**

Source: FAO, 2005.

Table 4. Number of farms and poultry populations in Indonesia.

System	Integrated centres	Number of farms	Population (million birds)	Average farm size
Commercial integrated (sector 1)				
Broiler	354	13,520	3.00	222
Layer	128	2,418	6.70	2,771
Total	482	15,938	9.70	609
Commercial (sector 2)				
Broiler		45,934	38.30	834
Layer		37,707	19.90	528
Total		83,641	58.20	1,362
Other (sector 3)			32.39	
Backyard (sector 4)			175.00	
Total			275.29	

Sources: CASERED, 2004; Ministry of Agriculture, Indonesia, 2005.

Table 5. Number of farms and poultry populations in Vietnam.

Characteristic	System		
	Family	Semi-industrial	Industrial
Number of Producers	13 million	5,000	2,000
Average flock size	<500	1 to 3 groups of 500 to 2,000 birds per year	> 2,000
% of national Production	65%	10-15%	20-25%
Details of their systems	Buy day-old-chicks, sell live birds. Mostly consumed locally.	Buy day old chicks from foreign and Vietnamese companies.	Includes state farms

Source: Delquigny *et al*., 2004.

Table 6. Classification details of farms included in the study.

Country	Sector 1	Sector 2	Sector 3	Sector 4
Cambodia	Believed not to exist	68 broiler units 9 layer units 1 hatchery 57 pullet raising units Estimated to be around 400,000 birds	40 broiler units 65 layer units 20-30 duck hatcheries 951 duck units Estimated to have 400,000 chickens and 841,000 ducks	99.9% of the farms (1.9 million) and 90% of the poultry population (11.96 million chickens and 2.73 million ducks)
Indonesia	9.7 million poultry – export orientated but with significant domestic consumption	58.2 million poultry for the national market	32.4 million poultry	175 million birds per year; 43.5 million eggs
Viet Nam	Relatively insignificant	20-25% of production, very few producers	10-15% of production, few producers	65% of production; involves up to 70% of Cambodians

Source: After Rushton and Viscara, 2005.

Results and observations

A high proportion of small scale poultry farming is conducted in sectors 3 and 4, suggesting that these sectors which have low bio-security are more likely to maintain HPAI epidemics. By far the majority of poultry farms in the countries studied fall into these categories (table 7). This creates a dilemma for policy makers; human and veterinary health public policy aims to promote rapid containment and eradication of zoonotic disease while development policy advocates sustainable agricultural practices accessible to the poor. It has been difficult for policy makers to find common ground between these two main areas of policy concern.

Cambodia

HPAI-H5N1 was first officially reported in Cambodia on January 23rd, 2004 in Kandal and Kean Suay provinces. Affected farms were primarily commercial.

Roughly 23,000 birds were culled or died; this number is particularly low compared to the numbers of birds lost in neighboring countries.

Table 7. Provinces, poultry systems, and number of birds affected by HPAI-H5N1 in Cambodia in 2004.

Month	Provinces affected	Number of birds affected			System
		Killed	Destroyed	Total	
January	Phnom Penh	3,200	3,300	7,500	Layer farm
March	Kandal Phnom Penh Siem Reap Takéo	4,799	6,125	10,924	3 layer farms 2 broiler farms 1 duck flock 3 local chicken farms 1 wildlife centre
September	Kandal	360	4,400	4,560	Broiler farm
Total		**8,359**	**13,825**	**22,984**	

Source: Rushton, 2005.

While economic losses in 2004 from HPAI-H5N1 due to bird deaths in Cambodia were low, the impact on market price and on consumer tastes and preferences was apparently much higher. As table 8 reports, mean prices of poultry products dropped significantly immediately following initial reports of HPAI-H5N1 in Cambodia, but rebounded shortly thereafter to greater than pre-HPAI levels, complicating analysis of micro-economic impact. Losses were estimated by Gauthier (2005) following conversations with producers and traders, and expressed as months of production needed to recover lost production. From table 8, broiler chicken markets were most severely affected (nearly three years to recover losses) with egg markets also showing high losses (nearly one year to recover losses). Duck markets showed the lowest losses.

Table 8. Price, quantity, and market value of poultry products before, during (January to February 2004), and after the first HPAI outbreak in Cambodia.

Item	Price per unit (US$)			Quantity			Total Value per month (US$)			Estimated Losses During	Number of months to recoup losses
	Before	During	After	Before	During	After	Before	During	After		
Broiler	1.04	0.39	1.30	4,500	250	3,800	4,678	97	4,938	9,161	35.3
Eggs	0.05	0.03	0.05	22,000	1,000	22,000	1,029	29	1,201	2,001	11.7
Ducks	0.91	0.81	1.30	300	10	300	273	8	390	530	4.5

Data refer to pre-, during, and after January-February 2005. Sources: Rushton, 2005; Gauthier 2005. (Exchange rate US$ = 3,848 Cambodian Riel).

Prices of substitutes (pork, beef, and fish) increased in early 2004 as tastes and preferences changed, steering consumers worried about contracting avian influenza away from poultry products beyond the month of March when sales of poultry products began to rebound. Unfortunately data were not available for substitute products.

While the direct impact of HPAI-H5N1 from losses of poultry was nearly negligible in Cambodia in 2004, without a richer dataset it is difficult to determine the impact due to changes in consumer tastes and preferences. It would seem obvious that producers whose greatest percentage of revenue came from poultry experienced greatest losses; these same producers probably also owed the largest amounts of borrowed capital, increasing losses beyond inventories and lost cycles of production. Social losses include the increased cost of protein and the loss of a relatively inexpensive source of food (poultry products), possibly resulting in increased levels of sub-optimal protein and energy consumption extending beyond the months of January and February 2004.

Despite efforts by Government veterinary public health officials to control the movement of poultry during the HPAI outbreaks, 5 of 21 traders interviewed continued their business during the ban. A mortality rate of 1% of purchased stock is considered to be normal by traders – the rate during the 2004 outbreak rose to 3.5%, probably attributable to birds infected with H5N1 reaching market points of sale. This should a cause for concern to public health officials charged with reducing exposure of humans to the HPAI-H5N1 virus.

All small scale producers that were interviewed responded that they would continue to raise poultry, although one third noted highly reduced personal consumption of poultry. Of the broiler farms surveyed, 75% expressed a wish to continue raising poultry; some producers shifted to pig production while a few farms had abandoned livestock agriculture. CP Company, a large feed manufacturer and contract grower of poultry and pigs in South East Asia, noted that before the crisis, sales of poultry and pig products represented 70% and 30% respectively. By August 2004, poultry sales had dropped to 50%. 2005 objectives were for 70% sales from pig products and 30% from poultry, a complete turnaround from the 2003 marketing strategy.

Indonesia

Indonesia first officially reported HPAI-H5N1 on January 25th, 2004, although significant losses due to unofficial reports (*i.e.* not officially diagnosed or due to delays in reporting) of HPAI occurred starting in August 2003. Data collected by CASERED (2004) indicate most significant losses in sectors 1 to 3,

particularly sector 3. From July 2003 to January 24, 2004 15 million layers, 2 million parent stock, and 86,000 broilers died or were slaughtered attributable to HPAI-H5N1. Although weekly supply of day-old-chicks reduced sharply by 17.5% for broilers and 25% for layers, market prices for live chicks remained constant. The price effects of the sharply reduced supply were probably moderated by producers (and consumers) changing tastes and preferences as it became understood that HPAI-H5N1 is a serious zoonotic disease.

Following January 24th, 2004 demand for poultry products fell sharply. With the subsequent increase in supply chicken prices plummeted to 1,200 Rupiah (US$0.13) per kg from a mean of more than 11,000 Rupiah (US$1.20) per kg. Demand showed continuing signs of improvement by April 2004, and prices had recovered to 10,000 Rupiah per kg by June 2004. However, by August and September 2004, further oversupply resulted in another round of price reductions. Remarkably the egg market appears to have been unaffected, possibly due to smuggling of eggs from Malaysia.

Avian mortality losses were primarily in provinces on the islands of Java and Bali. In Central Java and Bali, nearly one quarter of all poultry were slaughtered, while official reports of HPAI-H5N1 continued to October of 2004. In the case of Central Java where peri-urban concentrations of poultry farms are highest, provincial poultry losses represented more than half of all poultry losses in Indonesia.

Fifteen of the 30 provinces of Indonesia were affected by HPAI-H5N1 in 2004; 16.2 million poultry either died or were killed during control and eradication

procedures. The value of bird losses at pre-HPAI market prices was more than US$30 million. Data reported from CASERED (2004) also indicate that market demand for day old chicks and feed fell by 40% for layers and 58% for broilers during the outbreak; feed demand fell by 45%. Furthermore, poultry industry employment fell by more than one 23% on industrial farms and 40% of family laborers were unable to continue economic activities related to poultry farming. Nearly 60% of layer farmers and more than 90% of broiler farmers drew on their personal savings. Most farmers reported sale of personal assets and reduction in the scale of poultry farming.

Fluctuations of live broiler prices surrounding the early 2004 outbreak of HPAI are displayed in figure 1. All producers would be subject to these price fluctuations regardless of level of use of bio-security or the incidence of HPAI on farm and in province. Furthermore, the upstream impact of such price fluctuations is that demand for day old chicks, already under downward pressure from the presence of an avian disease, will reduce further. In the case of Indonesia, in January and February roughly 21 million broilers chicks were sold weekly; by March 2004 this figure had dropped to 14 million. Prices fell from Rupia 2,200 per chick to Rupia 200 per chick.

Total direct economic losses are estimated at US$171 million, not including control and eradication costs. Householders reported reduced spending on children’s needs including schooling although this was not quantified.

Table 9. Poultry populations and mortality losses due to avian influenza in Indonesia (2003-2004).

Province	Poultry Population (2003)		Losses due to HPAI		
	Birds ('000)	% of total	Birds ('000)	% poultry affected	% of total losses
Lampung	12,602	4.7	2,372	18.8	14.7
West Java	31,295	11.7	1,962	6.3	12.1
Central Java	34,262	12.8	8,178	23.9	50.5
East Java	38,155	14.3	2,260	5.9	14.0
Bali	4,042	1.5	930	23.0	5.7
Other provinces	146,437	54.9	485	0.3	3.0
Indonesia	**266,794**	**100.0**	**16,188**	**6.1**	**100.0**

Sources: CASERED, 2004; Government of Indonesia, Ministry of Agriculture, 2005.

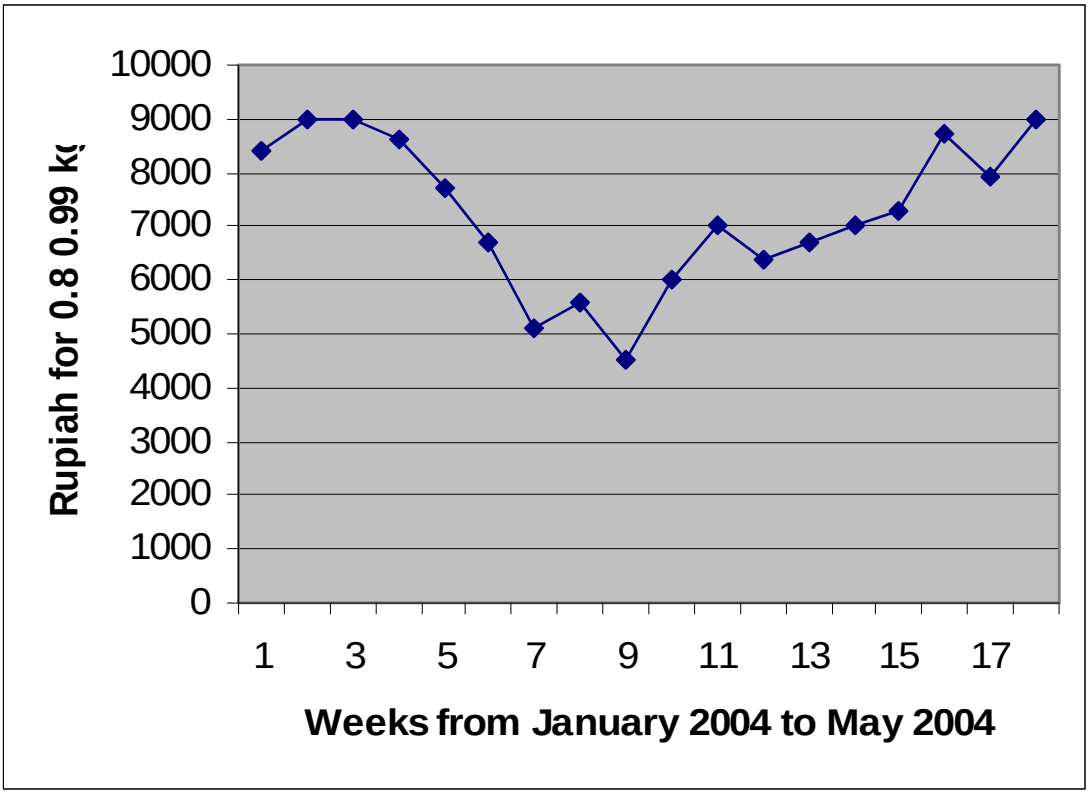

Figure 1. Broiler prices in and around Jakarta January to May 2004. (Source: Hartono, Indonesian Poultry Information Centre.)

Indirect losses calculated by the Indonesian Poultry Information Centre have been estimated at US$216 million (Dolberg, 2005), although there is no valuation of the losses of village and backyard farmers. This is unfortunate as they represent 30 million households raising 200 million native chickens.

Vietnam

Vietnam reported first official findings of HPAI-H5N1 on January 8th, 2004. By the end of the outbreak, 58 of Vietnam's 64 provinces were positive for HPAI-H5N1 and nearly 17% of the country's poultry had been destroyed in eradication efforts. However, the impact of HPAI has not been the same throughout all regions of the country. From table 10, there clearly was tremendous variation in the degree of losses experienced in the poultry industry across the country. Highest losses were, as was the case for Indonesia, in heavily populated peri-urban districts; 87% of all losses occurred around Ho Chi Minh City, the Mekong delta, the South East, and the Red River Delta, although these areas account for less than 60% of total poultry in the country. The latter is due to the high proportion of poverty and poultry ownership in more remote non-peri-urban areas. While outbreaks have continued in some areas of Vietnam, the country has made a strong effort to report and control HPAI-H5N1, and has welcomed international assistance to achieve containment and eradication.

Poultry market impact in the market for poultry and poultry products affecting traders and retailers. During the initial stages of the outbreak demand for poultry meat fell sharply. There were also heavy restrictions on the movement

of live birds. This in part was compensated by a more than doubling of prices when markets returned to normality, but it would be suspected that quantities traded would be far less than prior to the outbreak.

Prices for poultry meat fell during initial stages of the outbreak in 2004, as poultry were slaughtered and movements of live were restricted under containment and eradication procedures. However, as was seen in Cambodia, prices following the HPAI-H5N1 outbreak rebounded to more than double pre-outbreak levels, although post-outbreak market volumes were probably greatly reduced. In terms of loss of birds, sector 4 was hit harder than others in Vietnam with highest losses of household flocks. Again, poultry are not the only source of income (albeit a major one) for small scale producers, and medium scale producers would have lost greater amounts of total capital investment in agriculture.

Table 10. Poultry population and losses due to HPAI-H5N1 in Vietnam (2004).

Region	Poultry population		Poultry destroyed			Estimated losses	
	Birds ('000)	% total	Birds ('000)	% province	% total losses	US$ (‘000)	% total
North Central	36,680	14.0	1,902	5.2	4.4	5,133	4.4
Northern Mountains	42,190	16.1	923	2.2	2.1	4,626	3.9
Mekong Delta	58,499	22.3	18,842	32.2	43.6	49,747	42.3
Ho Chi Minh and South East	25,114	9.6	9,551	38.0	22.1	27,503	23.4
South Central	16,192	6.2	1,215	7.5	2.8	2,788	2.4
Red River Delta	65,503	25.0	9,137	13.9	21.2	24,778	21.1
North West	8,040	3.1	476	5.9	1.1	1,331	1.1
Central Highlands	9,645	3.7	1,123	11.6	2.6	1,584	1.3
Viet Nam	**261,864**	**100.0**	**43,170**	**16.5**	**100.0**	**117,490**	**100.0**

Source: J. Hancock, unpublished data, FAO, 2005. Value of bird + (slaughter and disposal costs) = US$2.72.

Prior to the crisis in July of 2003, survey results indicated that poultry production was the main economic activity for 68% of male headed poultry farms and 32% of female headed farms, whereas by July of 2004 the figure had dropped to 30% and 12% respectively. Many households have switched to alternate activities, principally pig production, which has had impact on suppliers and consumers of poultry products. Dolberg (2005), with the assistance of the Vietnamese Government, has estimated total direct economic losses to be greater that US$200 million. As for Indonesia, householders reported non-detailed reduced spending on children's needs including schooling. Vietnamese farmers also reported moving to pig production, reducing size of poultry farms for those remaining in the industry, drawing on savings, selling assets and labour, and – for small scale land owner farmers with relatively low levels of total investment in poultry – increasing land used for rice production.

Figure 2 portrays the point regarding losses to small vs. larger scale farmers for Vietnam. While small scale farmers in Vietnam may rely on poultry for cash income and food, raising of poultry forms a relatively small portion of total household economic activities (5-10%) compared to more commercial enterprises (20-85%). Loss of poultry, while it may mean a loss of particularly inexpensive protein and possibly cash for children's expenses, is not as likely to cause as devastating a blow to the economic viability of a household. The exception may be for those households in poverty or on the verge of sliding further into poverty; for these households, and economic shock may mean

prolonging poverty due to reactionary borrowing at high rates or loss of fixed assets including housing or land.

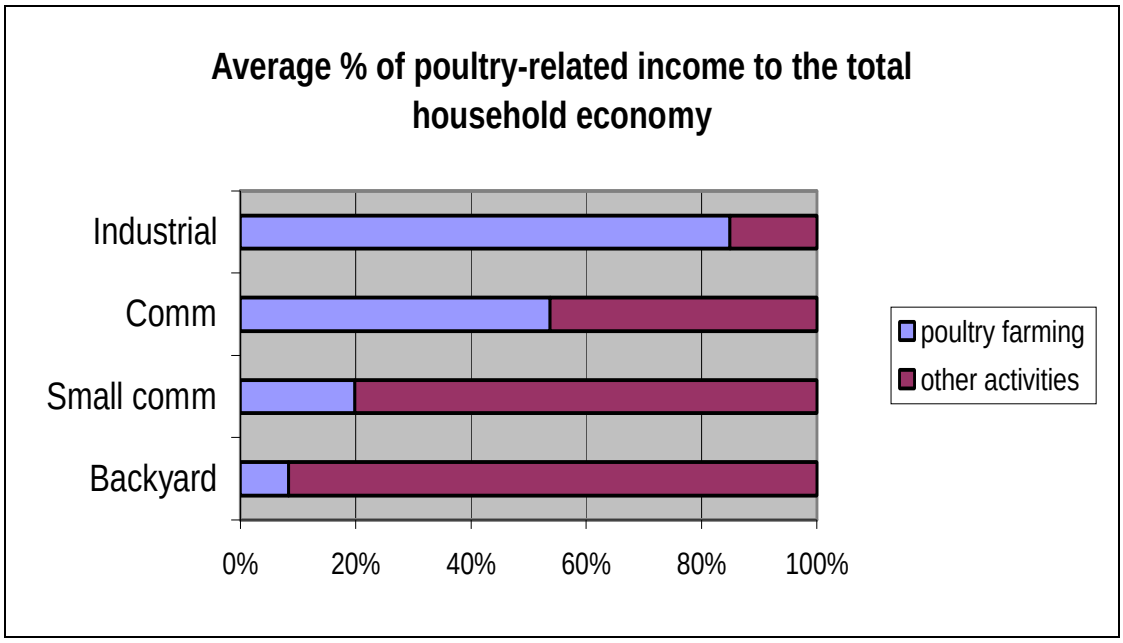

Figure 2. Percent of income based on poultry farming activities for Vietnam (source: Friscia, 2004).

Compensation and access to credit

The Government of Cambodia plans to develop a compensation scheme for poultry farmers affected by HPAI although budgetary constraints make that unrealistic for 2005-2006. While compensation schemes have been implemented in Indonesia and Vietnam, payments have been nil to slight and farmer-reported results have been mixed at best. Full details of compensation schemes are not clear but some figures have been reported. The Indonesian Government reports

that compensation in two phases was only paid to small scale farmers who were forced to cull stock due to HPAI-H5N1. During the first phase of payments, an average of US$364 was paid to 1068 farmers in eight provinces; during the second phase, an average of US$278 was paid to 1756 farmers in four provinces. Unfortunately, details of the farm holdings were not available. Preliminary indications from farmers who received payment are that only 10-20% of the market value of birds was covered.

In Vietnam, similarly unimpressive first accounts of compensation schemes were reported by farmers. Little total compensation has been disbursed despite Government plans to distribute US$13.2 million at a rate of US$0.30 per bird, and almost none has reached small scale producers (representing nearly 60% of all birds culled). Larger commercial farms have reported some compensation although the amount has been no more than 18% of market value of the birds culled. Vietnamese producers were supposed to receive day old chicks under a program of subsidization, although none of the farms report receiving such support.

In Cambodia, small holder credit is generally arranged through informal credit arrangements with relatives or neighbors. NGOs, farmer associations, and banks played a role for some larger scale farmers. In Indonesia and Vietnam banks have offered a number of financial coping strategies including rescheduling of loan payments, softening loan conditions, and increasing base loan amounts for new customers. However, data gathered from farmers indicates that larger scale farmers were more likely to receive credit; 38% of commercial

farmers received new loans as opposed to 12% of small commercial despite similar rates of application. The mean volume of credit required by Vietnamese farmers was reported as US$270 (small scale), $187.1 (small commercial), $768 (large commercial), and $2,665 (industrial enterprises). Volume of credit need was not reported for Indonesian farmers.

Further results pending

Using the data summarized above, simulations were conducted to estimate the economic surplus to consumers and producers before, during, and after the HPAI crisis. While results have not been approved for release, early indications have been presented at workshops to general consensus that small scale generally poor farmers were not left as badly off economically as one might expect, primarily for the reasons already outlined. Again, the loss of a cheap source of protein and energy is an important loss to compensate, and for some, loss of livelihood without re-training may mean increased conditions of poverty. Medium and large scale farmers were worst affected, although generally better educated and with access to credit and services not available for small scale farmers.

Preliminary results of the net welfare changes to producers and consumers in all three countries studied indicate that both consumers and producers experienced greater than 25% erosion in surplus as both quantities of poultry in markets reduced and prices sky rocketed. Ironically, where poultry was

relatively easily available in urban areas, it became difficult to sell due to strong changes in consumer preferences associated with food safety concerns.

Probit analysis results are also pending that begin to identify producer preferences for risk management strategies and compensation mechanisms. Surprisingly, cash compensation appears to rank lower as a coping and response mechanism than does restructuring assistance, restocking, increased veterinary care, and education.

Conclusions

A reluctant consensus is being drawn among the veterinary science community associated with control and eradication of HPAI-H5N1 that the virus is becoming endemic to the region, suggesting that control efforts will become a regular event. In contrast to this view is the strong position that the virus must be eradicated before endemicity is clearly established, due to the very serious risks of mutation of the HPAI-H5N1 to a form that will transmit between humans, setting off a global influenza pandemic with high losses of human life. Meanwhile, poultry farmers, governments in South East Asia, and international organizations are racing to overcome the conditions favourable to viral transmission leading to further epidemics. This includes restructuring of the poultry sectors of Indonesia and Vietnam, and possibly Cambodia. In other countries of South East Asia, planning of restructuring programmes has already been initiated although progress in development and implementation is slow.

An important part of a well thought out approach to compensation, restructuring, control, and eradication of zoonotic disease should be an economic evaluation of the damages caused and the socio-economic consequences of decisions and policy implementation. Unfortunately, as the state of this study shows, data are difficult to acquire and governments are sensitive to their use and release, making the task more difficult.

Preliminary work conducted thus far allows us to observe several points about the economic impact of avian influenza on producers in Cambodia, Indonesia, and Vietnam. In Cambodia, the majority of households keeping poultry have little or no other assets, leaving them vulnerable to financial hardship under conditions of devastating poultry losses. Despite an increase in the number of households with poultry following the outbreak of early 2004, and despite post-HPAI prices rising to greater than pre-HPAI levels, farmers are generally not prepared for other economic activities during times of low or non-production of poultry. For these small scale farmers HPAI-H5N1 has caused periods of significant economic hardship. Nevertheless, commercial farmers experienced much higher total losses and faced much greater credit repayment and asset replacement difficulties representing 75-100% of their gross worth. For these farmers, recovering from HPAI-H5N1 was possible only through acquisition of new debt or other external capital inputs.

In Indonesia and Vietnam, the picture was somewhat different for small scale farmers. In these countries, small scale poultry raising more clearly represents a relatively small proportion of total household earnings, distributing

the risk of devastating losses across several sources of economic activities. The majority of small scale poultry farmers in these countries rely on a mix of crops, off-farm labour, and other livestock enterprises for income generation. While HPAI-H5N1 may have resulted in significant short-term losses, the largest losses were experienced by medium and large scale farmers with much higher levels of total investment in poultry production. For these farmers, while recovery mechanisms may be easier to access, the economic impact of recovery will be longer lasting than for small scale producers.

Despite these observations, an important point regarding poverty alleviation needs to be made clear. Small scale farmers, though in general have lower levels of total asset investment in poultry, may be far more reliant on poultry for a source of protein and energy, particularly for children. This may be one of the most important and overlooked points in recovery schemes – there is no compensation for those families who have lost this source of cheap nutrition and cannot afford substitutes such as pork or beef. Development of policy options directed at compensation, restructuring, and eradication needs to include this dimension in planning and implementation.

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