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HPAI PRO-POOR HPAI RISK REDUCTION
HIGHLY PATHOGENIC AVIAN INFLUENZA

Poultry, HPAI and Livelihoods in Myanmar – A Review

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Mekong Team Working Paper No. 8

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Preface

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

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

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

With the above in mind, this document aims to provide a brief country economic overview; a review of the poultry sector that examines production, trade, markets and consumption; information on household income, food expenditures and poultry contribution to nutrition. Finally, it describes the course of HPAI and applied control measures, with their concomitant impacts on livelihoods, the poultry sector and the economy at large. This information should provide background information to be used as additional evidence for policymaking processes at national and international levels.

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Disclaimer

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Keywords

Avian Flu, Chickens, Ducks, Highly Pathogenic Avian Influenza, HPAI, Livelihoods, Markets, Market Shocks, Poultry Production, Poverty, Smallholder Farms, Smallholders, Southeast Asia, Myanmar.

More information

For more information about the project please refer to www.hpai-research.net.

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Executive Summary

The specific purpose of the DFID-funded Pro-Poor HPAI Risk Reduction Project is to promote evidence-based, pro-poor HPAI control measures at national and international levels. With that aim in mind, this document provides a brief economic overview of Myanmar; a description of the country's poultry sector, and a review of the course of HPAI and applied control measures, with their concomitant impacts on livelihoods, the poultry sector and the economy at large.

Macroeconomic Overview
In Myanmar, agriculture contributes more than 50% to GDP with roughly 40 million people directly involved. Livestock, growing at 7% annually, contributes almost one-sixth of agricultural GDP. Official data shows real GDP growth rising at an implausibly rapid pace; however, essential production input inflows coupled with high inflation rates and lagging nominal income levels suggest that actual GDP growth rates are lower and that real national output is weak. Reductions in social services indicate that populace is receiving very little assistance. Healthy revenues from exports of natural gas, garments, minerals, and gems lessen fiscal shortfalls. Social and economic progression remains hindered by sanctions and related contractions in foreign investments, trade, technical cooperation and aid. Overall, poor economic performance under military rule is a result of macroeconomic imbalances and structural problems, such as widening fiscal deficits and dual exchange rate systems.

Myanmar's Poultry Industry
Latest poultry inventory reports 105 million birds: 90% chickens and 10% ducks. Both confined and free-range chicken and duck production is concentrated mostly in rice producing areas. Almost half of all poultry is raised in 5 divisions (one-quarter in Yangon and Bago), with three main poultry production systems coexisting: (A) traditional, small-scale, extensive backyard poultry production, (B) semi-intensive, small- to medium-scale, market-oriented poultry production, and (C) intensive, large scale, industrially-integrated poultry production. Current output levels equate to almost 5 kg of chicken meat and 42 eggs available annually per person. The majority of farmers sell from eight to twelve birds in one to ten transactions per year to traders or directly at markets. The main poultry markets, which are inspected by local veterinarians, are located in Yangon and Mandalay.

Poultry and Livelihoods
Chickens and ducks provide for small purchases and contribute to ancillary household income. The average profit margin for village traders is 50-500 Kyat/bird, while merchants and market collectors earn 100-150 Kyat/bird. Nationwide, the average monthly household expenditure is roughly 29,000 kyat (equating to 5,500 Kyat *per capita* expenditure) with rural households having higher absolute and relative food expenditures with respect to total expenditures than urban households. The average rural farming household consumes an 8 kg of home-grown chicken meat and 20 eggs per year, oftentimes related to religious festivities or special occasions. The average level of dietary energy consumption is 2,900 kilocalories/person/day; three-quarters coming from starchy sources.

The HPAI Epidemic: Course and Institutional Response
The course of HPAI in Myanmar consists of 3 epidemic waves and repeated disease reoccurrences throughout 2007 and early 2008, with the first outbreak reported on March, 2006. Most poultry incidents occurred in Sagaing, Mandalay, Yangon, Bago and Shan divisions, resulting in more than 750,000 bird deaths and one non-fatal human case. Village backyard poultry production systems were predominantly affected, followed by commercial poultry operations. In response to outbreaks, Myanmar developed a contingency and action plan that consisted of (i) trade bans, (ii) seizure and destruction of illegal poultry shipments, (iii) making HPAI a reportable disease, (iv) creation of supervisory committees and sub-committees, (v) training of surveillance and culling teams, and (vi) a portfolio of control measures. Genetic sequences reveal that viral clades 2.2 and 2.3 were the most predominant.

Social and Economic Impact of HPAI and Control Measures

The most immediate and direct impacts of HPAI relate to economic losses of productive assets through bird mortality and public interventions, which, up to mid 2008, added up to US$ 1.2 million at current market prices. Another dimension of impacts relates to economic losses through consumer and market reactions. For example, in March 2006, total birds supplied at Yangon's poultry market dropped by 40%. Prices were also volatile, initially dropping by 50 to 80% and then jumping higher than pre-outbreak levels by 30 to 60%. These reaction-related impacts propagate upstream and downstream through related supply and distribution networks, thus affecting associated stakeholders in the short-term, and the industry as a whole in the longer-term through adjustments.

Conclusions

Animal health policymakers need to realize that transmissible avian diseases and their spread are a result of biological processes and economic behaviours of poultry supply chain participants, and that policies aimed at effectively controlling disease need to incorporate the complexity of its interactions with social and economic institutions. This is particularly important in the context of managing HPAI disease risk along Myanmar's borders and within its live mixed-bird markets. This is more so relevant considering that Myanmar is a country at high risk of HPAI re-infection because it borders Bangladesh, Lao PDR, India, Thailand, and People's Democratic Republic of China, all of which have reported HPAI outbreaks, and with all of which it engages in cross-border trade.

To achieve a pro-poor HPAI disease mitigation objective, it is necessary to implement market-based risk reduction strategies, including appropriate monitoring and traceability systems that could be strategically used to improve market-access terms for the rural poor and to improve sanitary standards of production units. These approaches not only abate disease, but also alleviate poverty.

It is also recommended that a judicious search for novel measures for equitable revenue generation, widening the tax base, elimination of ineffective subsidies, and reducing tax evasions and exemptions should be seriously considered before the government embarks in social and economic investments.

Generally, improvement of the business environment to foster private sector development and more investments in basic infrastructure are required to achieve sustainable growth rates in the long run. More specifically, agriculture sector strengthening should be a critical goal since it accounts for a major share of the country's GDP and people's livelihoods.

Introduction

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

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

It has been seen time and time again that prescriptive eradication measures fail to achieve their direct objective and that by driving the problem 'under ground', disease risk actually increases. Because of their diversity and weak institutional linkages in most of the affected countries, national policies cannot be designed and implemented effectively without close attention to local incentives. Despite international pressure to act quickly on control measures, one size will not fit all or even a significant percentage of local conditions.

To ensure effective, affordable and socially fair HPAI control programmes, national and international policy making needs to be based on stringent analysis of risks, consequences and risk management options.

This document is part of a series of documents that aim to provide comprehensive overviews of the economic (macro- and micro-) and institutional environment of countries that have been affected by HPAI, Myanmar being one of these. The document is divided into six sections. The first section deals with Myanmar's economy, population, labour force, agriculture and livestock sector. The second section deals with its poultry industry, specifically chicken and duck production systems, as well as marketing and trade. The third section is dedicated to the role of poultry in rural livelihoods, their contribution to income and nutrition as well as consumer preferences for poultry meats. The fourth section reviews the course of the HPAI epidemic in Myanmar and the structure of the national animal health systems and instituted control measures. The fifth section attempts to systematically compile the available information on the direct and indirect impacts of HPAI and HPAI control measures. Finally, the last section provides some preliminary conclusions on the issues that need to be tackled for Myanmar's poultry sector to successfully develop in the aftermath of HPAI.

Macroeconomic Overview

A proper macroeconomic assessment of Myanmar needs to examine the prevailing political context in order to understand the underlying socio-political drivers. The State Peace and Development Council is the organizational entity of the ruling military junta whose main objective is to protect its lucrative grip on power through the use of violence and intimidation to contain its opponents. The junta plans to push ahead with its so-called *roadmap to democracy*, which features a parliamentary election in 2010. Aung San Suu Kyi, the imprisoned leader of the National League for Democracy – the main opposition party – is not expected to be released anytime before elections.

The United Nations continues its restless efforts to persuade the junta to implement genuine political reforms, while fellow members of the Association of South-East Asian Nations (ASEAN) appear bent on taking tougher approaches with the junta, which reflects a degree of disappointment and frustration that the association's image continues to be tarnished by the junta's record on human rights abuses. So much is Myanmar's interest in easing international pressure and regaining public credence that it has agreed, rather reluctantly, to grant amnesty to around 9,000 prisoners.

Although not evident at first glance, deficiencies in data collection and presentation (i.e. dual exchange rates distorting official statistics) make an objective economic assessment difficult not only for analysts but also for authorities formulating policies. Unsurprisingly, official data continues to show real GDP growth rising at an implausibly rapid pace (i.e. 12.3% for 2002, 13.8% for 2003, and 12.6% for 2004); however, essential production input inflows such as fertilizers and power, coupled with high inflation rates and lagging nominal income levels suggest that actual GDP growth rates are much lower than officially released numbers and that real national output is rather weak (Table 1).

Table 1. Economic indicators from 2001 to 2005, Myanmar.

Description	2001	2002	2003	2004	2005
GDP*	7.8	8.7	9.9	11.2	12.2
Population (millions)	51.3	52.4	53.5	54.3	55.4
per capita GDP**	152	166	185	206	220
GDP growth (%)***	-	12.3	13.8	12.6	9.5
per capita GDP growth (%)	-	9.2	11.5	11.4	6.8

Source: EconStats, 2008; Myanmar's Ministry of Immigration and Population; IMF, 2008.
Note: * in billion US$ at current prices; ** in US$ at current prices; *** over previous year.

Economic instability is widespread: government spending is uncontrolled and fiscal deficits are widening. The latest figures from the Central Statistical Organisation reveal that the consumer price index rose by 31 percent year-on-year in May 2008 and by 29 percent in June 2008, fuelled by growth in currency inflows. A drop in social service spending such as health, education and welfare relative to GDP (from 5.7% of GDP in 1990 to 1.3% in 2003) indicates that the population is receiving very little government support. The proclaimed low incidence of poverty in Myanmar is less credible than ever given the *per capita* GDP in comparison to neighbours (Table 2).

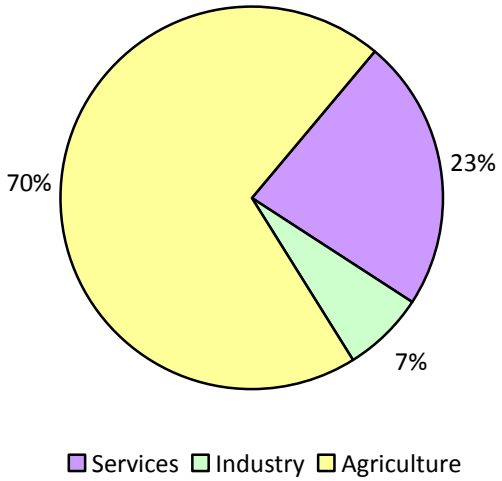
Table 2. Comparative *per capita* GDP and poverty incidence for Myanmar, Lao PDR and Cambodia.

Description	Myanmar	Lao PDR	Cambodia
Per capita GDP-PPP (in US$)	1,041*	1,882	2,857
Poverty Incidence (%)	23	39	36

Source: The Economist, 2008; Shein and Myint, 2001; Warr, 2005; RGC/WFP, 2002. * Average value from Box 1 below.

Much of Myanmar's labour force is agriculturally-oriented (Figure 1) and agriculture was hit hard by rains and flooding in 2008. Erratic power supplies are a problem for Myanmar's small manufacturing and industrial sector, which is plagued by frequent blackouts, forcing producers to rely on costly oil product imports to keep generators running.

Figure 1. Labour force by economic sectors, Myanmar, 2001.



Source: http://indexmundi.com/burma/labor_force_by_occupation.html

In May 2008 cyclone Nargis made landfall in Myanmar causing catastrophic destruction and at least 146,000 fatalities. Although the junta has set aside funds for post-cyclone reconstruction efforts, the heavy cost of rebuilding is likely to be borne mainly by international donors. In fact, aid-funded rebuilding efforts will boost construction sector growth, but this will be short-lived as there is not an appropriate legal and regulatory framework in place to sustain foreign direct investments.

With respect to trade, export revenue grew by 3.6 percent year-on-year from January to June 2008, rising to 16.2bn Kyat (US$3bn at the official exchange rate, or around US$13.4m at the free-market rate) aided by high exports of natural gas to Thailand, garments to China, minerals to Russia and India, and gems to various foreign markets. However, depressed exports of agricultural and fisheries products will take some time to recover after cyclone-related damages. In addition to having had a severe negative impact on the domestic economy in terms of lost agriculture and manufacturing output, the cyclone has hurt tourism too. Tourist arrivals fell by 35 percent year-on-year in May 2008 and by 17 percent year-on-year in June 2008, with a little less than 30,000 visitors for these two months.

The free-market exchange rate dropped to roughly 1,275 Kyat for US$1 in late September 2008. This slowly depreciative trend will continue but, given a sharp rise in remittances from overseas nationals supporting their families and further cyclone-related aid inflows, the Kyat depreciation may be temporarily stalled. Although tax revenues have surged and banking system recovery has ensued, it seems likely that the junta will continue to run large fiscal deficits; yet, these will not be driven wholly by reconstruction expenditures, but also by massive losses in inefficient state-led enterprises.

Conclusively, economic growth will likely be weak in 2008 - 2009 owing to severe economic damage from the cyclone and from retrograde monetary policies. The junta's economic mismanagement will persist, and there are serious concerns about its ability to manage the major reconstruction needed.

Social and economic progression will remain hindered by sanctions and the related contractions in foreign direct investments, trade, aid, and technical cooperation, coupled with diminished spending on social programmes and swelling inflation rates that exceed real income growth.

Box 1. Country facts

Official Name	Union of Myanmar
Government	Military Junta
Capital City	Yangon (Rangoon)
Area	676,578 sq km
Population (2008 est.)	58 million
Population Density	86 per sq km
Urban Population	25%
Rural Population	75%
Religion	Theravada Buddhism
Language (official)	Burmese
Currency	Myanmar Kyat (MMK)
Life Expectancy (m/f)	60/65 years
Inflation Rate (2008 est.)	28%
HDI [as published in 2007]	0.583

General Economic Indices	
GDP-2007 [PPP*]	US$60Bn (IMF); US$51Bn (WB); US$67Bn (ADB); US$59.33Bn (Average)
GDP-2007 *per capita*	US$1,053 (IMF); US$895 (WB); US$1,175 (ADB); US$1,041 (Average)
GDP composition/value	**Fiscal Year 2007**
Agriculture	54% - US$32.04 Billion
Industry	11% - US$6.53 Billion
Service	35% - US$20.76 Billion

Sources: The World Bank, Asian Development Bank, International Monetary Fund, wikipedia. * Purchasing Power Parity.

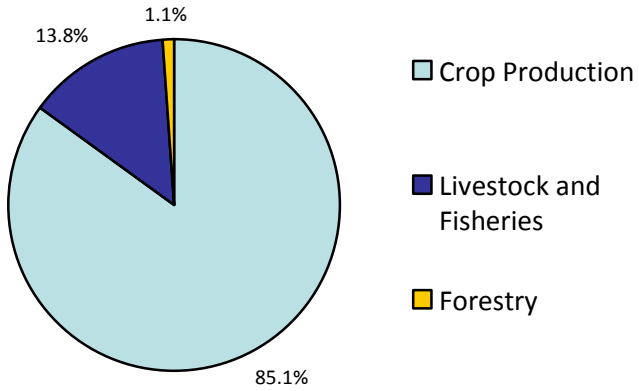
Myanmar is a participating member of the Greater Mekong Subregion Economic Cooperation Program (GMS - ECP) and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC).

Agriculture

Myanmar's economy is primarily agriculture based, with agricultural outputs accounting for 54 percent of GDP in 2007 (see Box 1). It consists mainly of crop production, hunting, fishing, livestock raising and forestry. Almost 41 million individuals are involved (completely or partially) in the agriculture sector. Myanmar produces enough food to feed most of the population, yet many people go hungry due to large income inequalities. One third of rural households do not have any land or livestock, while only one half of the arable land is under cultivation (MOAM, 2008).

Rice, whose production has increased dramatically in the past two decades, is the most important agricultural commodity (Figure 2). It is cultivated along river valleys, coastal areas, and in the very fertile Irrawaddy River delta. Increases in rice output are mainly due to supportive government policies, favourable market forces, as well as removal of restrictive government controls over the agricultural sector. However, tobacco, sugar, groundnut, sunflower, maize, jute and wheat have not reached their pre-1985 production levels, despite government support. The bulk of agricultural export trade consists of rice, teak, prawns, beans and pulses, and opiates (MOAM, 2008).

Figure 2. Composition of agricultural GDP, 2001 – 2002.



Source: Myanmar's Central Statistical Organization.

Because agricultural outputs are heavily reliant on extemporal monsoons, authorities have taken measures to improve irrigation, such as dam and reservoir build-up and renovations, and pumping water from rivers and streams. Additionally, improvements in agriculture are hindered by the lack of funding (credit) sources. For example, banking institutions servicing rural areas are scarce and lenders charge exorbitant interest rates. Consequently, farmers cannot afford to buy production inputs in a timely manner, thus negatively affecting crop yields.

The junta has been able to score modest gains in agricultural output levels through economic liberalization policies that consist of land distribution among the landless, improved irrigation, and an increase in the fixed price of paddy rice that government agencies procure from farmers.

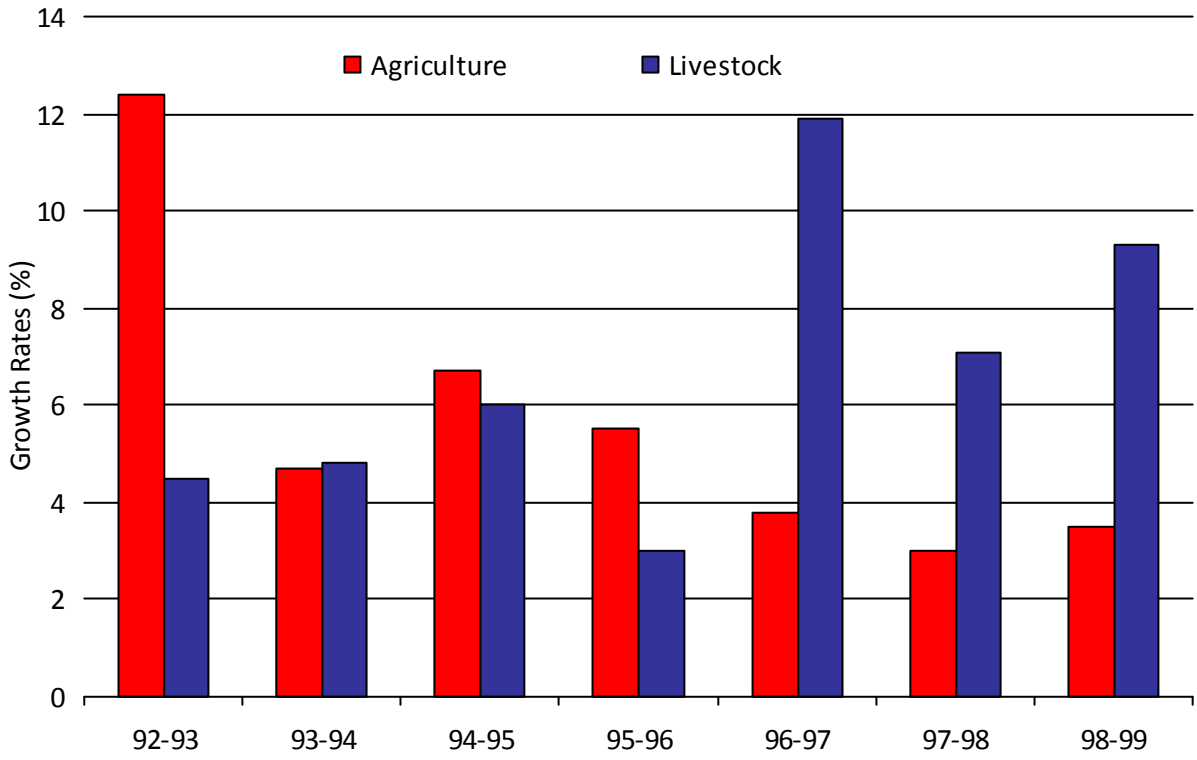
Livestock

For rural small-scale farmers, livestock keeping is a vital source of cash income, a means to accumulate assets, and a provider of inputs to crop production (i.e. manure and draught power). Cattle, buffaloes, pigs, sheep, goats, chickens and ducks are the most important livestock species in Myanmar. Of special importance are oxen and water buffaloes because they serve as draught animals for cropping and for rural transportation. Most cattle are raised in the northern dry zones.

From 1992 to 1999 agriculture grew at a rate of almost 6 percent, while the livestock sub-sector grew a little faster at close to 7 percent (Figure 3). Because Myanmar possesses extensive lands and a lengthy coastline, both livestock and fisheries are important contributors to national farm output.

Similarly, from 1992 to 1999, the most reliable estimate from the Central Statistics Organization indicates that livestock (including fisheries) contributed 14 percent to total agriculture GDP.

Figure 3. Agriculture and livestock sector growth rates, Myanmar, 1992 – 1999.



Source: Greater Mekong Subregion Business Forum (www.gmsbizforum.com).

National and regional demand for all meat types is increasing, and there is growing potential for exporting livestock and their by-products to neighbouring countries. However, despite these opportunities, livestock support services, research and extension, marketing networks, transportation and communication links, access to inputs and credit availability are all very limited and need to be improved to attain competitiveness.

The Myanmar Livestock and Fisheries Development Bank (MLFDB) established in 1999 under the reign of the Ministry of Livestock and Fisheries (MLF) finances large-scale livestock and fishery investments. In 2002, it supported 510 livestock and fishery projects through 4.8 billion Kyat loans. Although a major feature of its mandate is to promote agricultural development, it has no substantial role in funding small-scale livestock investments usually sought by rural smallholding farmers.

Myanmar's Poultry Industry

The total poultry population of Myanmar in 2006 – 2007 was 105.3 million birds. The poultry population was mainly composed of chickens (93.7 m birds; 89%), followed by ducks (10.1 m birds; 9.6%) and other avian species (1.45m birds; 1.4%). Table 3 shows bird distributions by species raised in Myanmar. For the latest poultry population dataset by State/Division, see Annex 3.

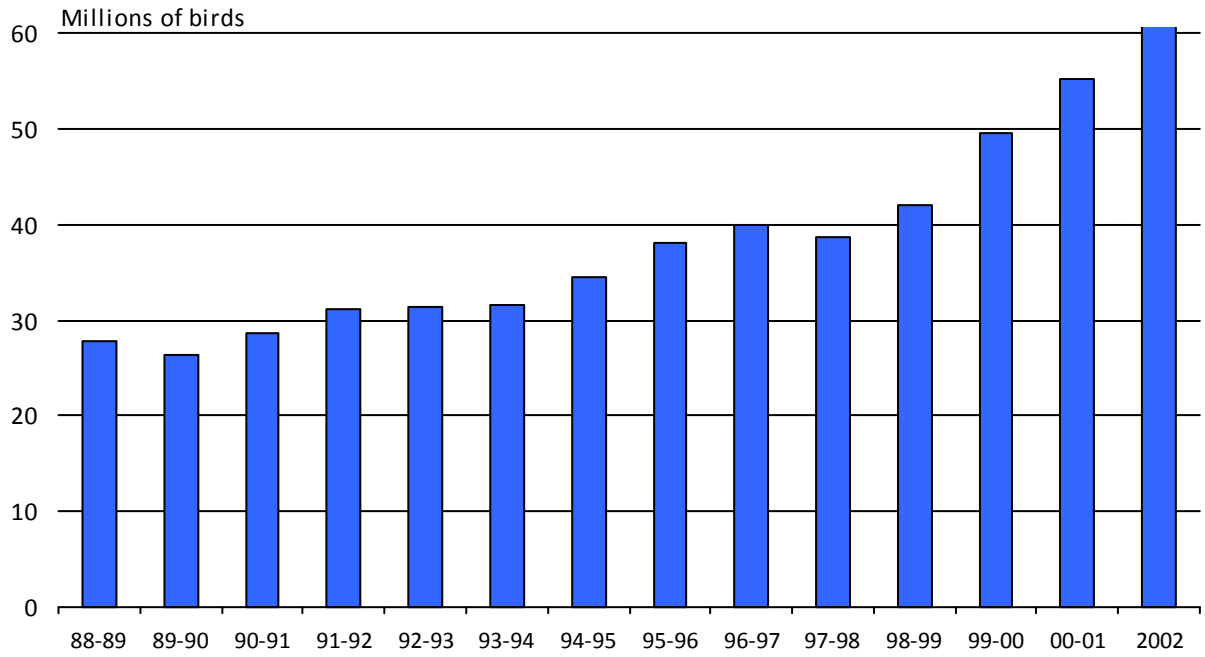
Table 3. Total poultry population, Myanmar, 2006 – 2007.

Species	Heads (in millions)	Percent
Chickens	93.7	89.0
Ducks	10.1	9.6
Muscovies & Geese	1.1	1.0
Quails	0.4	0.4
Totals	**105.3**	**100.0**

Source: Kyaw, 2008.

Poultry inventories have been rising steadily since 1988 from 27.8 million to 61.7 million in 2002 (Figure 4). Since there are no official poultry data between 2003 and 2006, little is known about bird population dynamics during this timeframe, however, it is widely believed that inventories rose abruptly (MLF, 2008).

Figure 4. Poultry population in Myanmar, 1988 – 2002.



Source: Ministry of Livestock and Fisheries (www.myanmar.gov.mm/ministry/live&fish/livestock.htm).

Geese, turkeys, pigeons and quails are also raised as alternative sources of food and income, but only constitue a minor proportion of the overall national poultry inventory. The large majority of urban and rural households keep poultry, but they also keep other small livestock as part of risk diversification strategies. Both confined and free-range chicken and duck production is concentrated mostly in rice producing areas which provide abundant and inexpensive feed resources (MLF, 2008).

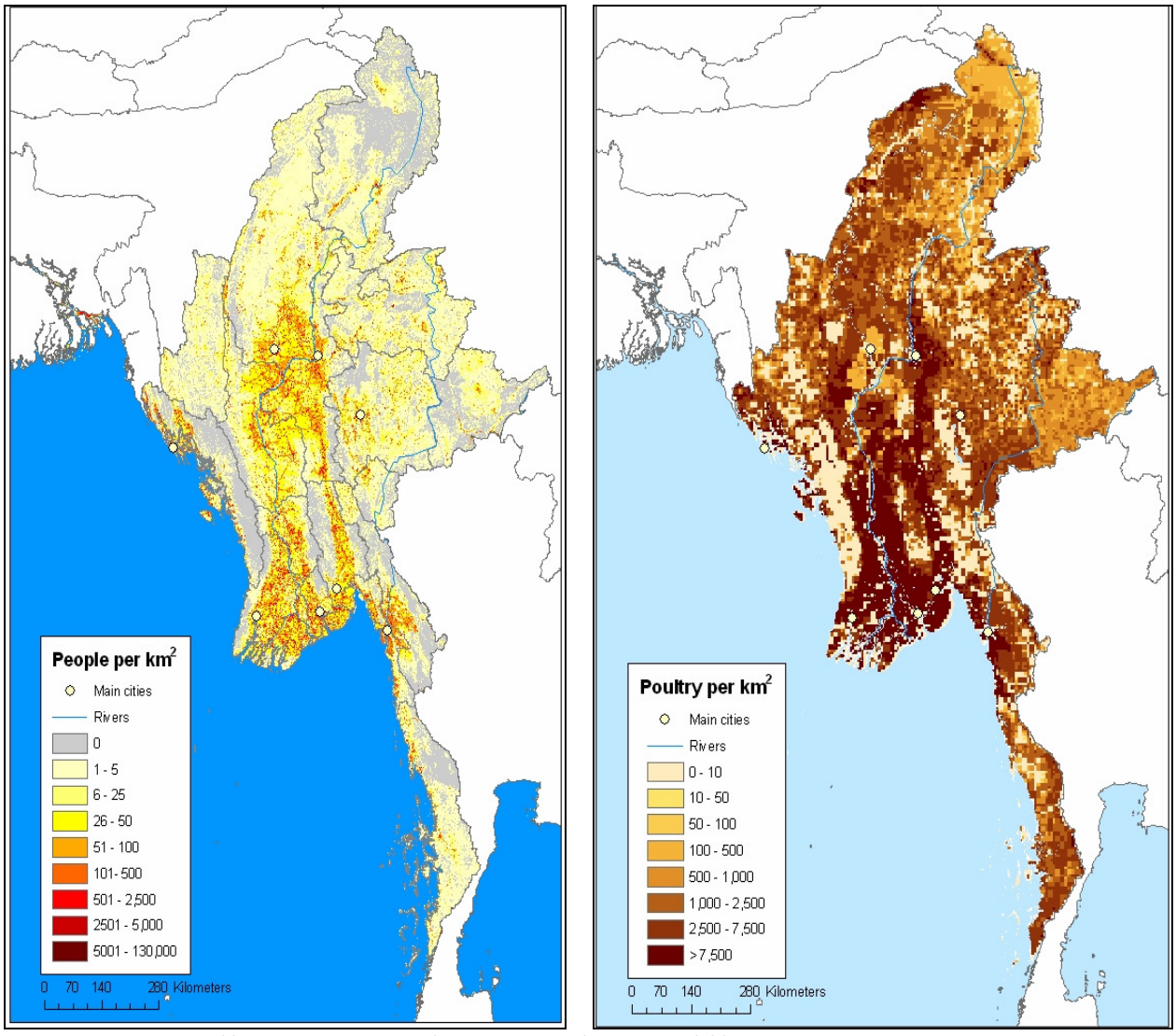
Nearly half (≈45%) of Myanmar's poultry are being raised in 5 divisions, namely: Mandalay, Sagaing, Yangon, Bago and Shan. With 15 million birds, the Yangon division has the largest poultry inventory, followed by the Bago division with 12 million birds. Combined, Yangon and Bago account for 42 percent of the national duck population, and for a quarter of the national chicken flock (Table 4).

Table 4. Poultry inventories* in selected divisions, Myanmar, 2005.

Division	Chickens	(%)	Ducks	(%)	Geese & Muscovies	(%)	Totals by Division	(%)
Mandalay	8,048	8.6	262	2.6	48	4.4	8,358	7.9
Sagaing	7,725	8.2	234	2.3	42	3.8	8,001	7.6
Yangon	13,124	14.0	1,732	17.1	189	17.2	15,045	14.3
Bago	9,758	10.4	2,524	25.0	102	9.3	12,384	11.8
Shan	3,326	3.5	67	0.7	29	2.6	3,422	3.2
Subtotal	**41,981**	**44.8**	**4,819**	**47.7**	**410**	**37.3**	**47,210**	**44.8**

Source: LBVD, 2005 and Williams, 2006 as quoted by Morgan, 2007. *Values expressed as thousands of birds.

Box 2. Maps of human and poultry population distributions.



Source: Maps generated by FAO – AGAL using the most recent datasets available.

Chicken meat and egg production predominates over duck meat and eggs. Chicken meat output has almost tripled from 1995 to 2002. Over this period, production of turkeys and geese has only slightly increased, whereas production of duck meat and eggs has almost doubled (Table 5). In relation to the 2001 - 2002 human population, chicken meat and egg production equates to an availability of roughly 4.86 kg of chicken meat and 42 eggs per person. Evidently, the consumption of chicken meat and eggs in Myanmar is quite low compared to developed countries. Furthermore, while *per capita* consumption of fish was 28.45 kg in 2001 - 2002, *per capita* consumption of all other meats (including poultry) was 9.85 kg, which is a third of fish consumption (MLF, 2008).

Table 5. Poultry products by species, Myanmar, 1995 – 2002.

Item	Unit	95-96	96-97	97-98	98-99	99-00	00-01	01-02
Chicken Meat	MT ('000)	101.2	113.8	138.6	147.1	180.1	216.8	253.3
Duck Meat	MT ('000)	16.6	18.0	18.7	19.7	23.7	29.2	30.9
Turkey/Geese	MT ('000)	1.8	1.8	1.8	1.8	2.0	2.2	2.2
Chicken Eggs	Millions	951.3	1,070.1	1,226.0	1,310.2	1,695.2	2,068.0	2,194.0
Ducks Eggs	Millions	150.4	161.3	168.4	177.4	219.1	255.0	269.0

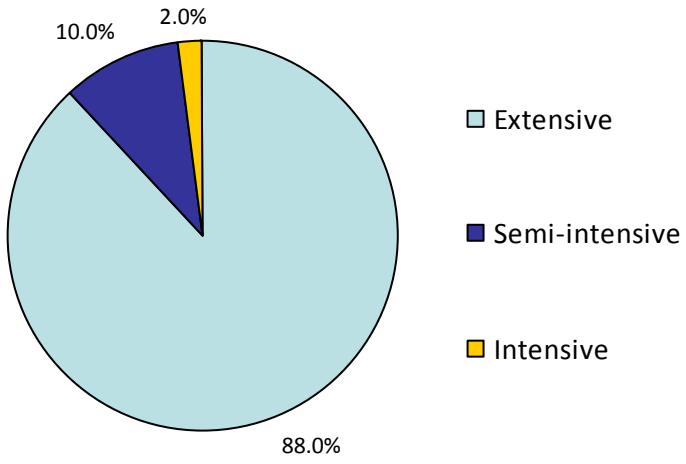
Source: Ministry of Livestock and Fisheries (www.myanmar.gov.mm/ministry/live&fish/livestock.htm).

In many urban areas an increasingly affluent middle class is growing rapidly, which in turn is raising demand for poultry products (meats, eggs and by-products). This unsatisfied, latent demand could be largely met through national production outputs (chicken and duck broilers and layers).

Chicken and Duck Production Systems[1]

This report uses a threefold classification system to describe poultry production in Myanmar: (**A**) traditional, small-scale, extensive backyard poultry production, (**B**) semi-intensive, small- to medium-scale, market-oriented, commercial poultry production, and (**C**) intensive, large scale, industrially-integrated poultry production. Figure 5 below show poultry distribution by production system.

Figure 5. Poultry distribution by production systems, 2006.

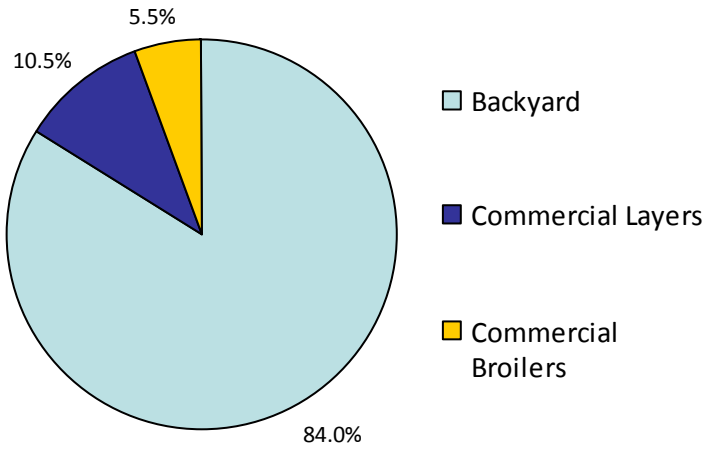


Source: Ministry of Livestock and Fisheries, 2006.

Figure 6 shows that chicken production in Myanmar is dominated by smallholding backyard systems (78.7 m birds; 84%), with a small commercial sector (15m birds; 16%).

[1] This section draws heavily from research work performed in Myanmar and published by Henning and collaborators (2006, 2007, 2008).

Figure 6. Total chicken population by output emphasis, 2006.



Source: Kyaw, 2008; Ministry of Livestock and Fisheries; Henning *et al.*, 2007.

Traditional, small-scale, extensive backyard poultry production

This type of production system accounts for a little over four fifths of the entire Myanmar chicken population. Besides rice cropping, pig keeping, and fish/prawn raising, nearly all farmers in rural areas own some poultry. Women, men and children are mostly responsible for tending care to birds, devoting from 8 to 14 minutes per day to cleaning, watering and feeding. Average flock size in village settings ranges from 30 to 40 birds per household. An average flock consists of 4 hens, 2 cocks, 12 chicks, and 12 growers. Since mature hens and cocks are owned, there is no need to purchase day-old chicks because own-stock hatchlings are readily available. Three egg batches are produced per hen per year and from the 12 eggs laid on average per batch, one is consumed or lost while the remaining 11 are set under the hen for incubation and hatching. From these, roughly 8 will survive up to two months of age, which represents 66 percent survivability.

Local chicken breeds are overwhelmingly popular in rural Myanmar. Some of these breeds are Hle Pyaung, Tanyin, Taik Kye, and Sittagaung. In addition to chicken flocks, farmers keep 1 to 5 ducks, and 1 to 3 turkeys and geese.

The village birds scavenge for food in backyards, gardens, orchards and vacant lots, however they are nearly always provided with water and non-purchased supplementary feeds (broken rice and food scraps) on a daily basis. Overnight, birds are kept underneath homes, inside the cowshed, in trees, natural sheds and bird shelters (made of bamboo and palm leaves), all of which are provided with nests for laying and brooding. On average, 30 to 50 minutes per month are spent building nests or maintaining bird shelters.

Rural village farmers are relatively knowledgeable about poultry diseases. Many of them are able to distinguish fowl pox, diarrhoea, and Newcastle disease in their flocks. Reportedly, one-quarter of chicks and one-fifth of growers die within the first month of age, mostly from diseases, extreme weather (heat stress), theft, and predation (vultures, rats, snakes).

As for ducks, these are mostly Muscovies and common ducks. Muscovies predominate because they are less water-dependent than common ducks. Muscovy males can weigh up to 2 kg, while females weigh up to 1.5 kg. Common ducks weigh up to 1.75 kg and can lay three clutches of 10 to 12 eggs

per year. Hatching performance for both duck species appears to be about 80 percent. Most chickens and ducks raised are consumed, the remaining are sold. The cash raised from sales is used for medicines, education, garments and purchases of food items. Poultry production in Myanmar is normally combined with other livestock (small and large) keeping, but the degree in which this occurs depends on wealth status, market access, and land availability. Rural village farmers report that most assistance needed from the government is for efficacious vaccines and vaccinations, supply of new and improved breeds, and extension services.

Semi-intensive, small- to medium-scale, market-oriented, commercial poultry production

This production system has from 50 to 1,000 birds per flock. Depending on location, infrastructure and stock-carrying capacities, birds can either be kept as free-grazers or in confinement. Gardens, backyards, orchards and vacant lots are oftentimes fenced to allow birds to be brought back in the evenings after scavenging or to remain enclosed. Bio-security measures, although not comprehensive as compared to intensive units in OECD countries, are implemented to prevent some of the economically important poultry diseases, while sanitation, animal treatment and management are given a little bit more attention compared to village (backyard) chicken/duck production systems. Feed and water are provided either continuously or intermittently. Production times range from 60 to 90 days and mortality rates are moderate (<10%). Restocking occurs by own-stock hatchings but also by purveying day-old chicks. Production outputs have somewhat more formal marketing options and mainly consist of live birds, poultry meats and eggs.

Much land in Myanmar is devoted to rice production, and mixed-farming systems therefore include duck keeping that takes advantage of the available resources. Ducks, although of lesser importance than chickens, are raised outdoors near rice paddies, lakes, swamps and ponds. Flocks usually consist of 10 to 200 ducks kept openly or in semi-roofed, netted lots nearby ponds and lakes with seasonal medical treatments applied according to prevailing diseases. Duck raising coincides with rice supply periods, however, supplementary feeds are offered intermittently depending on natural feed availability. The main health issues duck farmers face are respiratory and nervous problems, and viral gastroenteritis. For both species, the initial investments required are higher than in village backyard systems but lower than intensive commercial systems.

Intensive, large scale, industrially-integrated poultry production

This production system operates with flock sizes from 1,000 to 5,000 birds. It is a capital and resource-intensive activity with high levels of investment in animal management, poultry health, house maintenance, and bio-security resulting in high levels of flock productivity. Furthermore, it normally uses commercially-designed and high production infrastructures that include elaborate and usually automatized housing, feeding and drinking systems. As it is exclusively market-oriented, this system has the highest rate of commercialization and uses specific outlets (shops and supermarkets) to sell directly to consumers.

Nutritionally-balanced, energy-dense commercial feeds and micronutrient-loaded water are provided to enclosed birds. Restocking with day-old chicks is entirely achieved by purveying them locally or regionally (i.e. China or Thailand). Broilers (meat birds) are fattened for 6 weeks or 42 days until reaching 1.75 to 2.0 kg, after which they are rendered. Layers produce anywhere from 250 to 270 infertile eggs per year. As for commercial layers (chicken and ducks), replacement birds are imported from neighbour countries (China or Thailand).

Charoen Pokphand (CP), a Thailand-based business conglomerate, has operations in Myanmar. CP supplies commercial broiler feeds through Myanmar CP Livestock Co. Ltd., but shares the market for commercial layer feeds with South Korean CJ Animal Feeds and Biochemical Products. CP has also ventured into animal health products which it supplies through its established feed and chick distribution network throughout the country. For example, it imports ND/IB vaccines from Thailand.

Poultry and Poultry Product Marketing

Most poultry outputs produced by rural farming households are consumed based on family needs. Everything that is left after satisfying family nutrition requirements is destined for farm-gate or local market sales. The choice of marketing venue depends on proximity to market(s), availability of middlemen/traders, urgency to raise cash, and demand for village (native) chickens.

According to Henning and collaborators (2007) more than 90 percent of farmers in Myanmar sell chickens, at varying intervals ranging from one to ten times a year. Eggs, however, despite steady supply are very rarely sold. On average, farming households in villages around Yangon Division of Myanmar sell 8 to 10 birds per year, most of which are male and female chicken growers, and sometimes ducks, turkeys and geese. The prices for different types of chickens range from 1,100 to 1,700 Kyat per bird (Table 6), but price fluctuations (i.e. from a minimum of 150 Kyat to a maximum of 2,000 Kyat) are common depending on season. The low-price season runs for 5 months from March to July whereas high-price season runs for 3 months from October to December. The most common causes for temporary price depressions are oversupply of fish, oversupply of birds due to die-offs (diseases or heat stress), and/or natural disasters (flooding). Also, in the capital city, Yangon, 18-month-old commercial layers command a slightly higher price than commercial broilers due to their lower fat content and tougher meat texture – a phenomenon also seen in other countries.

Table 6. Average selling prices of chicken types and eggs in Myanmar (Yangon Division).

Description	Price in Kyat	Price in USD*	Price in USD**
Chicken Egg	35 – 40	5.38 – 6.15	0.03 – 0.04
Female Grower	1,186	182	1.03
Male Grower	1,245	192	1.08
Hen	1,603	247	1.40
Rooster	1,684	259	1.46
Trained Fighting Cock	3,000 – 5,000	462 – 769	2.60 – 4.34

Source: Henning *et al* (2006 and 2007). * Official rate USD1 = MMK6.5 in January 2009, ** free-market rate.

Half of all bird-owning households sell birds directly to or at market stalls (for a 50 to 100 Kyat market usage fee), while the other half relies either on traders/middlemen or neighbourhood sales (Henning *et al.,* 2006 and 2007). In Myanmar, product flows are usually facilitated by (1) several bicycle-owning middlemen/traders collecting birds during late morning at farm gates of producers in their respective commune or village (10 locations per day) for a (2) motorcycle-owning middleman/trader who himself, along with others, collects between 20 to 50 birds in communes, villages and towns, and transports these over longer distances (15 to 30 miles) for (3) car-owning middleman/trader, who buys birds for about 50 to 100 Kyat above the farm gate price, and finally moves and sells the accumulated output from communes, villages, towns and districts to market retailers in their respective locales or neighbouring provinces during late afternoon hours.

In certain areas of Myanmar (i.e. Mandalay Division) fight cock raising and training is common. Betting on fighting cocks is a widely accepted social pastime in Southeast Asia, yet in many countries it is strictly forbidden and therefore punishable by law. On average, five fighting cocks are kept with one hen within a flock, all of which scavenge for food in village environment and are supplemented daily with broken rice. Strength-building training fights occur weekly, lasting about 3 to 4 hours. Interviewed owners of fighting cocks reveal that this activity is highly lucrative, much more than raising village chickens for market sale. For example, a 9-month old trained fighting cock can command from 3,000 to 5,000 Kyat (Table 6); however, well-trained and competition-winning fighting cocks between 12 and 16 months of age can be sold for 30,000 to 50,000 Kyat, while top-class fighting cocks have been reportedly sold for up to 150,000 Kyat (Henning *et al*, 2006).

Poultry Markets

In Yangon, the capital city, the live mixed-bird market is the largest in Myanmar consisting of roughly 70 stalls and handling close to 40,000 birds each day coming from Yangon, Bago and Ayeyarwaddy divisions. This live mixed-bird market is currently managed by the Yangon City Development Committee (YCDC) which collects user's fees and oversees its day-to-day functions. It hosts a government veterinarian, but also employs two 'in-house' private veterinarians whom together certify the health status of all incoming poultry and approve sales at vending stalls. In fact, private veterinarians pre-check birds before they are submitted for inspection and government-mandated certification by the public veterinarian seconded by the Livestock Breeding and Veterinary Department. Additionally, veterinary officials collect samples at market premises twice a month (Morgan, 2007).

The composition of birds traded is: commercially raised chickens (55%), village-backyard chickens (35%) and ducks (10%). The majority of incoming birds are sold live to wholesale outlets and market stalls where they are slaughtered and processed according to customer specifications. To ensure hygienic conditions and reduce the likelihood of disease outbreaks, an array of bio-security measures have been put in place that include, but are not limited to, weekly cleaning and thorough disinfection of infrastructures, vending stalls and poultry carrying crates (Morgan, 2007).

Poultry and Livelihoods

The economy of Myanmar remains largely agrarian, with livestock playing an integral role in rural mixed-farming systems that include cattle, buffalo, pigs, goats, sheep, fish, prawns and poultry (chickens and ducks). More specifically, poultry are of considerable importance to the livelihoods of smallholder and village farmers, particularly in remote mountainous areas where it represents the main source of animal protein and provides cash income in times of need. Poultry production has been highlighted as a tool for poverty alleviation with the potential of promoting rural economic growth and in contributing to gender equity among disadvantaged communities.

The Contribution of Poultry to Household Income

There is no specific government data detailing the contribution of poultry and poultry product consumption and sales to overall household income. Recent information gathered through rapid rural appraisals and participatory field surveys provides an initial understanding of rural dwellers' perceptions regarding the importance and value of poultry to their livelihood.

During January 2004, Henning and collaborators (2006) recorded farmer's comments pointing out that chickens and ducks only provide '*pocket money*' for small purchases, yet female heads of households do esteem them a bit more since they generate a '*small supplementary household income in addition to husband's earnings*'. In general, village poultry are considered a '*side issue*' because most rural farmers '*do not want to depend on it*'. Some of the reasons for this disdain are: '*there is not enough money to be made in chickens or ducks*', '*they damage garden vegetables and take up time*', '*there are too many diseases affecting chickens*', and that '*fish never seem to be affected by disease*'.

To deepen their understanding of the role of poultry in rural households (HH), Henning *et al.* (2007) conducted a survey of ten villages of two townships in the Yangon Division. Three-quarters of respondents considered chicken keeping of much less importance than crop production (i.e. rice, peas and beans), surprisingly however, 64 and 11 percent of farms did rate chicken keeping as very important for the 'potential' cash income from sales and for home consumption, respectively. These findings are in consonance with reports from neighbouring countries in the region (Burgos *et al*, 2008 a, b, c). Furthermore, locally available lakes and ponds are used to breed and raise fish, which are again regarded to be at least equally if not more important than chickens.

Although poultry revenues might not be highly regarded in poultry-producing rural households in Myanmar, this is evidently not the case for people involved in the supply chain whose total or partial monthly income depends on poultry trading activities. For example, the average buy-sell margin for rural village middlemen/traders goes from a low of 50 Kyat per bird to a high of 500 Kyat per bird depending on season, but is definitely more stable (from 100 to 150 Kyat per bird) for those that supply wealthier merchants and market collectors. As a result of steady supplies and repeatable sales, market collectors/merchants make a quick profit of 100 Kyat per bird for only temporarily holding 10 to 100 birds close to or at city markets (Henning *et al.*, 2006 and 2007; Morgan, 2007). Furthermore, profit margins of middlemen and traders vary by country as evidenced by Mlozi *et al* (2003) who report that in Tanzania they earn up to 65 percent of total profits from village chicken sales as compared to only 10 percent in Myanmar (Henning *et al.*, 2006).

The contribution of poultry revenues to total household income is usually lower in remote, isolated rural villages as their disadvantaged locations prevents middlemen/traders to visit them. In contrast, poultry-keeping households in (peri-)urban locations (especially those close to city markets) will most likely report higher incomes from poultry sales, and this, should be taken into consideration when making generalizations about the importance of poultry for rural livelihoods.

In addition, poultry-derived income calculations may underestimate the importance of poultry to specific livelihoods as these calculations do not take into account to whom within a household this income accrues (i.e. usually it goes to women).

Total and Food Expenditures

From a 30,000 randomly sampled household (HH) survey, it is inferred that nationwide average monthly HH expenditure to be roughly 29 thousand kyat, with higher expenditure levels in urban compared to rural areas resulting in a roughly six thousand Kyat differential between urban and rural households (≈33,500 vs. ≈27,600 Kyat). Regardless of location, average household size is five people. Likewise, nationwide *per capita* expenditure is roughly 5,500 Kyat, with higher *per capita* expenditure levels in urban (≈6,300 Kyat) compared to rural areas (≈5,100 Kyat) (Table 7).

Table 7. Average household size and monthly expenditure levels, Myanmar, 2001*.

Description	Nationwide	Urban	Rural
Average Household Size (No. of People)	5.37	5.32	5.39
Average Monthly Family Expenditure (Kyat)	29,310	33,561	27,607
Household *Per Capita* Expenditure (Kyat)	5,458	6,308	5,122
Estimated Monthly Food Expenditure (Kyat)	14,655	13,424	16,564
Proportion of Expenditure on Food	50%	40%	60%

Source: http://www.csostat.gov.mm/survey.asp

* Data from the Household Income and Expenditure Survey (HIES) 2001.

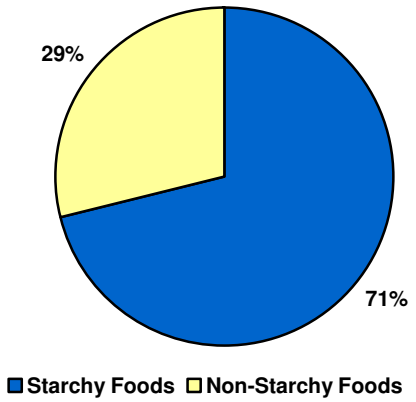
Rural households have higher absolute and relative (16,564 Kyat; 60%) food expenditures with respect to total expenditures than urban households (13,424 Kyat; 40%). Broadly, rural households spend ≈3,100 Kyat (approx. 25%) more on food than urban households. Urban household earn more money but assign resources to other expenditures that rural household do not incur, contrarily, rural households earn on average less money, and, as a result, the share of food expenditure is higher.

Food Consumption Patterns and Nutritional Status

In general, basic diets are composed of rice, fruits, vegetables, and some animal protein. Based on FAOSTAT data from 2001 to 2003 the national average level of dietary energy consumption in Myanmar was 2,900 kilocalories per person per day, partly contributed by 79 grams of dietary protein consumption per person per day (equivalent to ≈505 kcal) and by 49 grams of dietary fat consumption (equivalent to ≈336 kcal) per person per day (FAO, 2006a). This level of dietary energy consumption is higher than that reported in Lao PDR (≈2,100 kcal/person/day) and Cambodia (≈2,600 kcal/person/day).

Figure 7 below (*in next page*) shows the contributions of starchy (e.g. potatoes, beats, sugar, honey, corn, rice, fruits, and bread) and non-starchy (e.g. butter, margarine, oils, cheese, meats, nuts, vegetables and beans) foods to caloric energy intake.

Figure 7. Estimated caloric contribution of starchy and non-starchy foods to total caloric energy intake per person in Myanmar*, 2001 – 2003.



Source: FAO, 2006a. * based on 2,900 calories/person/day.

According to FAO (2006b), the 5 percent rate of undernourishment[2] in Myanmar is relatively low when compared to the average for Southeast Asia (12%) and the AsiaPacific Region (16%). Although comparatively low, between 2001 and 2003 almost three million people were defined as being undernourished in Myanmar. Taking into consideration recent cyclone-related damages, it is estimated that this proportion could, however, have increased to 6.2 percent of the population, i.e. to around 4 million people (FAO 2006 a,b). With respect to child nutrition, estimates from 2000 indicate that the prevalence of wasting[3] is 9.7 percent while the prevalence of stunting[4] is 37.2 percent. The prevalence of overweight[5] children is 7.7 percent (FAO, 2006a).

The Contribution of Poultry to Nutrition

Based on recent rural household surveys, more than 90 percent of farming households eat home grown chicken meat and consume an average of 8 kg of chicken meat and 20 eggs per household per year (Henning *et al*, 2007). In Yangon and Mandalay divisions, chicken meat is only consumed once or twice a month, or during religious festivities or special occasions such as the visit of a distinguished guest. For all households surveyed, fish consumption was higher and more frequent than chicken consumption (Henning *et al*, 2006).

Consumption of poultry meat is an important contributor to human nutrition. Recently updated macronutrient intake guidelines for people aged 19 to 70 suggest between 46 to 56 grams of protein per day regardless of source (USDHHS/USDA, 2005). It is estimated that 100 grams of fried broiler chicken meat contributes 30 grams of protein and 15 grams of fats.

Chicken meat is lean and high in protein and supplies varying amounts of micronutrients, such as iron, zinc and vitamins. On the other hand, eggs provide proteins and substantial amounts of several important vitamins and minerals, such as vitamins A and B12, folate, thiamin, riboflavin, phosphorus, and zinc (for more information read USDHHS/USDA, 2005).

[2] defined as people below two standard deviations of the average of weight-for-age.
[3] defined as children below two standard deviations of the national average of weight-for-height.
[4] defined as children below two standard deviations of the national average height-for-age.
[5] defined as children above two standard deviations of the national average of (Body Mass Index) BMI-for-age.

The HPAI Epidemic: Course and Institutional Response

Myanmar is a country at risk of HPAI because it borders Bangladesh, Lao PDR, India, Thailand, and People's Democratic Republic of China, all of which have reported HPAI outbreaks. The following section provides a detailed account of the course of the HPAI epidemic in Myanmar, a brief overview of Myanmar's animal health services, and the institutional responses mounted by competent authorities.

Course of the HPAI Epidemic

In Myanmar, the estimated date of primary infection with HPAI is March 8, 2006. This first HPAI outbreak was officially reported to the World Organization for Animal Health on March 12, 2006 (OIE - WAHID, 2006). This initial outbreak occurred in village birds in Aung Myae Thar Zan, in the Mandalay Division, resulting in 780 dead birds.

The course of HPAI in Myanmar consists of 3 epidemic waves and repeated disease reoccurrences throughout 2007 and early 2008 (Table 8). It is not yet clear when or how the virus was introduced, however hypotheses revolve around wild bird transmission to domestic poultry owing to Myanmar's vast wetlands and large water reservoirs, but also relating to cross border poultry trade with Thailand and China. In fact, before HPAI outbreaks were recorded in Mandalay and Sagaing divisions in early 2006, commercial breeding operations in western China were heavily engaged in large scale exportation of fertile eggs and day-old chicks to Myanmar (Morgan, 2007).

As shown in Table 8, most HPAI outbreak waves and reoccurrences in poultry occurred in 5 out of 17 divisions: Sagaing, Mandalay, Yangon, Bago and Shan. Village (backyard) poultry production systems were predominantly affected, followed by commercial poultry operations (Kyaw, 2008).

Table 8. HPAI outbreaks in Myanmar, 2006 – 2008*.

Description	Year	Month	Location (Division)	Approx. number of bird deaths
1st Wave	2006	March/April	Mandalay and Sagaing	650,000
2nd Wave	2007	Feb/March	Yangon	65,000
Re-Occurrence	2007	May	Yangon	1,000
Re-Occurrence	2007	June	Bago (East and/or West)	960
Re-Occurrence	2007	July	Mon	950
Re-Occurrence	2007	July	Bago West	7,500
3rd Wave	2007	Nov/Dec	Shan East	30,000
Re-Occurrence	2008	Dec/Jan	Shan East	1,100

Source: Kyaw, 2008; * for more detailed information please visit http://www.oie.int/wahis/public.php?page=home

The death toll in 2006 was by far the largest, with approximately 86 percent of animal losses occurring in Sagaing and Mandalay. In early 2007, Yangon registered further bird deaths and later viral resurgence in other divisions. According to Inui (2008) HA clade 2 is the most dominant in Asia. Final genetic sequence data from recent Myanmar's outbreaks has yet to be released, but data presented by Gleeson (2008) speculates that it may likely cluster together with clade 2.2 (detected in Bangladesh and India) or clade 2.3 (strain detected in Malaysia and Laos). There seems to be very little relationship with Thai viral clade 1 that swept through central Thailand in 2004.

The occurrence of the only recorded HPAI infection in humans coincides with periods of HPAI outbreaks in poultry (concurrent with 3rd wave: Nov/Dec 2007). Luckily, this human case of HPAI was not fatal. More details can be found in Annex 2.

Animal Health Services

The Ministry of Livestock and Fisheries (MLF) of the Union of Myanmar is responsible for the development of livestock and fisheries sectors. The principal objectives of the MLF are (a) to promote development in the livestock and fisheries sectors, (b) to increase meat and fish production for domestic consumption and share surpluses with neighbouring countries, (c) to encourage the expansion of marine and freshwater aquaculture, and (d) to upgrade the socio-economic status of livestock and fishing communities (MLF, 2008).

The MLF is composed of six collaboratively interrelated government institutions: Directorate of Livestock and Fisheries; Department of Fisheries; Livestock Breeding and Veterinary Department; Livestock, Feedstuff and Milk Products Enterprise; The University of Veterinary Sciences, and Beekeeping Division (MLF, 2008). The ministry employs roughly 8,250 staff (Morgan, 2007).

The Livestock Breeding and Veterinary Department (LBVD) is responsible for the development and animal health of the livestock industry in Myanmar. This department is also responsible for conducting research and training, producing vaccines and providing extension services to farmers (MLF, 2008). It employs close to one thousand veterinary officers (Morgan, 2007).

Noticing reports of HPAI outbreaks in neighbouring countries in late 2003 and early 2004, Myanmar decided to develop a contingency plan for the control of HPAI in animals. This plan consisted of (i) trade ban from infected countries, (ii) illegal shipments to be seized and destroyed, (iii) making HPAI a reportable disease [through MLF notification No. 9/2004], (iv) creation of a central supervisory committee and sub-committees for HPAI, and (v) creation and training of surveillance and culling teams at township level (Kyaw, 2008).

The Animal Health and Development Law, enacted in 1993, include orders, notifications, instructions, and legislations for the prevention and control of contagious animal diseases. However, HPAI was not included in the original law, which thus had to be revised. Within the context of the National Strategic Plan for Prevention and Control of Avian and Pandemic Influenza Preparedness and Response, a National Health Committee (NHC) was set up in mid 2006 to respond to HPAI outbreaks. The NHC is chaired by the minister of health and aided by 25 related ministry representatives.

Institutional Response

Under the guidance of the NHC, a set of immediate control measures at country level were devised in 2006 – 2007 to abate disease risk. These measures include, but are not limited to, the following:

1. Strengthened disease surveillance, monitoring and inspections
2. Implementation of containment measures
3. Stamping out measures (without compensation)
4. Enhancing diagnostic capabilities
5. Establishment of disease-free zones
6. Encouragement of information sharing
7. Development of emergency preparedness plans
8. Engagement in public awareness and communications

From the list above, three items deserve further explanation; as well as a brief comment on impact mitigation measured implemented.

Disease surveillance, monitoring and inspection

This included comprehensive surveys and active surveillance/monitoring in wet markets (urban and rural live mixed-bird markets), wet lands, and wild bird sanctuaries. Activities included frequent

inspections at restaurants, food stalls, and poultry farms. Active post-outbreak surveillance commenced in affected areas and was extended to surrounding non-affected areas (especially in 5 townships in the Sagaing Division and 13 townships in the Mandalay Division from May to June 2006).

Diagnostic capabilities

This included notification, training and technical support to staff stationed at diagnostic laboratories, quarantine stations and transit check points throughout Myanmar (Kyaw, 2008). Table 9 provides details on the location of the above facilities in the country.

Table 9. Location of diagnostic laboratories, quarantine stations and check points.

Diagnostic Laboratories	Quarantine stations	Check points
Mandalay Region	Mandalay International Airport	Tamu
Pathein Region	Kyauk Phyu Seaport	Maung Daw
Yangon Region	Yangon International Airport	Muse
Muse Region	Thilawa International Seaport	Tachilate
Kyaing Tone Region		Myawaddy
Taungyi Region		Kaw Thaung

Source: Kyaw, 2008.

Activities included the provision of rapid test kits for type A influenza and influenza subtype H5, AGID and ELISA test kits for type A influenzas, and in selected locations with Reverse Transcriptase – Polymerase Chain Reaction (RT-PCR) equipment and reagents to test for type A influenza subtypes H5 and H7.

Public awareness and communications

This included publications and articles on prevention and control of HPAI in local newspapers and periodicals, as well as the distribution of compact discs, pamphlets, booklets, handouts and manuals regarding preventive measures. Senior government officials and respected academics appeared in radio talk shows and television programs talking about avian influenza, and proper bird and food handling. In the public sector, avian influenza-related training workshops, seminars, symposiums and visual presentations were held (>215,000 attendees) to raise awareness and gain commitment (Kyaw, 2008).

Cooperation and collaboration between government agencies was and remains critical to controlling HPAI in Myanmar. Seven institutions are actively engaged in implementing prevention and control measures, namely: ministry of livestock and fisheries; ministry of health; ministry of trade; ministry of home affairs; customs department, and Myanmar livestock federation. As for international assistance, consultancies in the fields of disease prevention and control, disease diagnosis and biosecurity enhancement were received from FAO, European Union, UNICEF, USAID and OIE (Kyaw, 2008). For more information on international financial assistance to Myanmar, see Annex 1.

Impact mitigation measures

The Myanmar Livestock and Fisheries Development Bank (MLFDB) aided 109 farmers with soft loans (54.5m Kyat) and contributed fifty million Kyat to a restocking programme. Within this programme, MLF distributed 87,000 day-old chicks to poor rural farmers, while a total of 709 farms restocked 1.7m birds in HPAI affected areas. The FAO/AusAID supplied genetic stock worth €21,000 and vitamin premixes worth 35.4m Kyat in late 2007. Moreover, the Sagaing Division agreed to provide 181 acres in 5 townships for the establishment of poultry production zones. Local governing units expedited the conclusion of public service projects (telephone, water and electricity) in 3 severely affected areas. The private sector is considering establishing emergency funds to deal with future calamities.

Social and Economic Impact of HPAI and Control Measures

An accurate quantification of the impacts of avian influenza (and of other epidemic diseases) is complicated by the fact that direct impacts on livestock producers will propagate up- and down-stream through related supply and distribution networks, that short-term reactions are likely to be followed by longer-term adjustments, that impacts include direct cost elements and revenue foregone, and that losses to the poultry sector will, at least to some extent, be 'externalized' on the one hand and, on the other hand, be compensated for by gains in other livestock sub-sectors.

Immediate Impacts through Mortality and Public Intervention

The most immediate and direct impacts of HPAI outbreaks relate to economic losses of productive assets through bird mortality and public interventions (i.e. culling). According to the most reliable data provided by Kyaw (2008), up to mid 2008 there were a total of 760,000 bird deaths, which translates roughly to US$ 1.14 million at current market prices (US$1.50/bird). See table 10 below.

Table 10. Estimated immediate direct impacts through mortality and culling, 2006 – 2008.

Description	Units	Amount
Total approximate animal loss	Birds	760,000
Arbitrarily set market price (average)	US$/bird	1.50
Total estimated monetary loss	US$	1,140,000

Source: Authors' calculations based on values presented by Kyaw, 2008 and Morgan, 2007.

Immediate Direct Impacts through Consumer / Market Reactions

Another dimension of impacts, usually following productive asset loss, relate to economic losses through consumer and market reactions (i.e. changes in supply, demand and prices). In this case, producers with non-infected birds bear the brunt of the effect because reduced demand fuelled by consumer fears significantly depresses the price they receive for their products (be it live birds, slaughtered birds, eggs or feathers). In addition, producers have to reduce production levels that result in future revenue shortfalls.

Demand, supply and prices for poultry changed when HPAI outbreaks started to appear in the country in 2006. The most noticeable locations in which these changes are felt were live mixed-bird markets, and especially in Yangon, where aftershocks took place in the form of market volume and market price adjustments over a period of one year and more (See tables 11 and 12 below).

For example, in March 2006 after HPAI was confirmed, total birds supplied at Yangon's live mixed-bird market dropped from 29,000 to 17,000 birds (or 41%). Village and commercial chickens as well as ducks suffered a similar fate, with slumping market volumes from February to March 2006.

It can be argued that backyard chickens were relatively immune to market shocks owing to expressed preference for this type of birds (people report these are tastier) over others: village chickens saw the least volatile market inventories, whereas ducks were the most volatile (Table 11).

Table 11. Market volume adjustments from Yangon's live mixed-bird market*, Feb 2006 – Feb 2007.

Month - Year	Village Chickens (Birds)	Ducks (Birds)	Commercial Chickens (Birds)	Total Supply** (Birds)
Feb – 2006	14,000	2,800	6,700	29,000
Mar – 2006	13,000	300	930	17,000
May – 2006	17,000	1,000	1,140	23,000
Jun – 2006	14,500	900	10,000	32,000
Aug – 2006	18,600	2,650	10,800	35,000
Feb – 2007	19,500	1,200	6,000	36,000

Source: Morgan, 2007. * The actual market name is Mingala Taungnyirat; ** includes other bird species offered.

As for market price adjustments, all bird types traded saw their retail prices cut by more than half between February and March 2006 (Table 12). By June 2006 however all prices had returned to pre-outbreak level, but it is interesting to note that a year later, by February 2007, prices were far above their initial record, thus implying that new price equilibrium had been established.

A steeper price increase was seen in village chickens (66% increase) compared to commercial chickens (45% increase) and ducks (37% increase) within a single year (from February 2006 to February 2007) and by February 2007 total supply had not only recovered but also surpassed pre-outbreak levels.

Table 12. Market price adjustments from Yangon's live mixed-bird market*, Feb 2006 – Feb 2007.

Month - Year	Village Chickens (Kyat)	Ducks (Kyat)	Commercial Chickens (Kyat)
Feb – 2006	2,400	2,300	1,900
Mar – 2006	900	950	800
May – 2006	2,200	1,750	1,350
Jun – 2006	2,800	2,100	2,500
Aug – 2006	2,500	2,500	2,300
Feb – 2007	4,000	3,150	2,750

Source: Morgan, 2007. * The actual market name is Mingala Taungnyirat.

It is important to keep in mind that the above price and volume movements are representative of only one live mixed-bird market with limited extrapolation nationwide.

Producers adjusted output to reduced market opportunities and table 13 below reflects the case of a duck layer farm before and during HPAI. Production dropped from 500 to 100 eggs per day, and prices fell from 50 to 20 Kyat per egg, resulting in income reduction of 690,000 Kyat per month.

Likewise, prices for spent ducks plunged to one tenth of the pre-HPAI level.

Table 13. Production, price and income variations due to HPAI in a 700 duck farm, Bago Division.

Description	Before HPAI	During HPAI
No. eggs produced per day	500	100
No. of days eggs are sold	30	30
Price (Kyat/egg)	50	20
Income from egg sales (Kyat)	750,000	60,000
Price (Kyat) of spent ducks	1,000 – 1,500	100 – 150

Source: Morgan, 2007.

Short-term Indirect Flow-on Impacts

One of the most salient phenomena was the sharp rise in the price of feedstuffs and day-old chicks from suppliers immediately after HPAI outbreaks. This may have been a temporary corporate strategy to compensate for losses resulting from reduced purchase orders or merely a quick-cash move to enhance revenues or just supply and demand dynamics.

Table 14. Changes in costs, prices and profits in broiler production due to HPAI, Yangon Division.

Description	Before HPAI Outbreaks	Immediately After HPAI
Feedstuffs	400	1,500
Day-old chicks	300	600
Miscellaneous*	300	300
Total production costs	1,000	2,400
Cash market prices	1,200	2,600
Intermediary agent profit	200	200

Source: Morgan, 2007. * includes inherent profit margin for producer, usually of 100 – 150 Kyat per broiler.

Table 14 illustrates the case using data from a broiler production unit in the Yangon division before and immediately after HPAI outbreaks were reported in Myanmar during the 2nd epidemic wave that took place in February - March 2007. The price of feedstuff abruptly increased to nearly fourfold while the price of day-old chicks doubled, resulting in a net rise of production costs of 1,400 Kyat per bird.

For a more thorough review of the impacts of avian influenza virus on animal production in developing countries, see Otte *et al.* (2008).

Conclusions

Myanmar evolves under an authoritarian governing system. For the most part its rulers shy away from free-market economic models, which, coupled with macroeconomic imbalances, poor governance, fiscal mismanagement, weak regulatory frameworks and infrastructure bottlenecks continue to weigh down on investments and economic growth. The country has an agriculture-based economy heavily reliant on crop production, with livestock and fisheries contributing a mere 14 percent to agricultural GDP. Latest estimates indicate that there are 105 million birds raised in Myanmar, out of which 94 million are chickens, mostly (84%) kept under backyard production systems and marketed via associated informal trader networks.

Three separate HPAI epidemic waves were recorded in Myanmar from 2006 until mid 2008 causing a total of 760,000 bird deaths (mortality and culling) and 1 non-fatal human case. Most outbreaks took place in village (backyard) poultry farms located in Sagaing, Mandalay and Yangon divisions. In response to HPAI outbreaks, the Government implemented containment measures, poultry movement controls, public awareness-raising, uncompensated culling, thorough cleaning and disinfection of premises, disease surveillance and monitoring, and establishment of disease-free zones. The responsible animal health authorities adapted disease control measures to the prevailing situation but vaccination was not implemented.

The immediate direct economic impact of HPAI adds up to more than US$ 1 million, but it is difficult to estimate the associated up- and downstream effects due to lack of reliable and detailed information. After outbreaks were reported to authorities and confirmed in laboratories there were tangible changes in demand for and supply of poultry and poultry products resulting from consumer fears of contracting disease and stamping out measures and temporary price volatility ensued. As a result of market disruption, changes in production costs and profit margins were reported by farmers, suppliers, intermediaries and retailers, all of which had their livelihoods affected to various degrees.

Animal health policymakers need to realize that transmissible avian diseases and their spread are a result of biological processes and economic behaviours of poultry supply chain participants, and that policies aimed at effectively controlling disease need to incorporate the complexity of its interactions with social and economic institutions. This is particularly important in the context of managing HPAI disease risk along Myanmar's borders and within its bird markets. To achieve this goal, market-based risk reduction strategies, including appropriate monitoring and traceability systems, could be strategically used to improve market-access terms for the rural poor and to improve sanitary standards of production units.

It is recommended that a judicious search for novel measures for equitable revenue generation, widening the tax base, elimination of ineffective subsidies, and reducing tax evasions and exemptions should be seriously considered before the government embarks in social and economic investments. Generally, improvement of the business environment to foster private sector development and more investments in basic infrastructure are required to achieve sustainable growth rates in the long run. More specifically, agriculture sector strengthening should be a critical goal since it accounts for a major share of the country's GDP and people's livelihoods.

References

Burgos, S., J. Hinrichs, J. Otte, D. Pfeiffer, and D. Roland-Holst (**2008a**) *Poultry, HPAI and Livelihoods in Viet Nam – A Review*. Pro-Poor HPAI Risk Reduction Project, FAO - PPLPI. Mekong Region Working Paper No. 2. Available at www.hpai-research.net

Burgos, S., J. Hinrichs, J. Otte, D. Pfeiffer, D. Roland-Holst, K. Schwabenbauer and O. Thieme (**2008b**) *Poultry, HPAI and Livelihoods in Cambodia – A Review*. Pro-Poor HPAI Risk Reduction Project, FAO - PPLPI. Mekong Region Working Paper No. 3. Available at www.hpai-research.net

Burgos, S., J. Otte, D. Pfeiffer, R. Metras, S. Kasemsuwan, K. Chanachai, S. Heft-Neal and D. Roland-Holst (**2008c**) *Poultry, HPAI and Livelihoods in Thailand – A Review*. Pro-Poor HPAI Risk Reduction Project, FAO - PPLPI. Mekong Team Working Paper No. 4. Available at www.hpai-research.net

FAO – Food and Agriculture Organization of the United Nations (**2006a**) *Food Security Statistics: Myanmar*. Last update 03/03/2006. Available at www.fao.org

FAO – Food and Agriculture Organization of the United Nations (**2006b**) *Myanmar: Monitoring progress towards hunger reduction goals of the World Food Summit (WFS) and the Millennium Declaration (MD)*. Last update 03/09/2006. Available at www.fao.org

Gleeson, L. (**2008**) *Highly pathogenic avian influenza H5N1 observations on regional dynamics*. Presentation imparted at the AB-CRC meeting in Bangkok, Thailand, June 24th, 2008, 19 slides. Available at http://www.abcrc.org.au/UPLOADS/PUBLICATIONS/PUBLICATION_287.pdf

Henning, J., A. Khin, T. Hla, and J. Meers (**2006**) *Husbandry and trade of indigenous chickens in Myanmar – Results of a participatory rural appraisal in the Yangon and the Mandalay divisions*. Trop. Anim. Health. Prod. 38: 611 – 618.

Henning, J., R. Pym, T. Hla, N. Kyaw, and J. Meers (**2007**) *Village chicken production in Myanmar – purpose, magnitude and major constraints*. World's Poult. Sci. J. 63: 308 – 322.

Henning, J., J. Morton, T. Hla, and J. Meers (**2008**) *Mortality rates adjusted for unobserved deaths and associations with Newcastle disease virus serology among unvaccinated village chickens in Myanmar*. Prev. Vet. Med. 85: 241 – 252.

Inui, K (**2008**) *Highly pathogenic avian influenza H5N1 – Observation on regional dynamics*. Presented as data in a research meeting in Bangkok, June 24th, 2008.

Kyaw, M (**2008**) *Avian influenza and its control in Myanmar*. Presentation submitted (but not imparted) at the Workshop on Research Activities on Avian Influenza and Other Transboundary Animal Diseases in South-East Asia, Bangkok, Thailand. 21-22 January, 2008.

MLF – Ministry of Livestock and Fisheries (**2008**) *Official website of the ministry*. Available at http://www.myanmar.gov.mm/ministry/live&fish/default.htm

Mlozi, M., A. Kakengi, U. Minga, A. Mtambo and J. Olsen (**2003**) *Marketing of free range local chickens in Morogoro and Kilosa urban markets, Tanzania.* Livestock Research for Rural Development, 15(2).

MOAM – Ministry of Agriculture of Myanmar (**2008**) *Myanmar Agriculture: Statistics*. Available at http://www.moai.gov.mm/statistics.htm

Morgan, N (**2007**) *Myanmar: the livestock sector, poultry and AI*. FAO Internal Report, 10 pages.

OIE – WAHID (**2006**) *Highly pathogenic avian influenza in Myanmar*. 1st Report – 12/3/3006.

Otte, J., J. Hinrichs, J. Rushton, D. Roland-Holst and D. Zilberman (**2008**) *Impacts of avian influenza virus on animal production in developing countries*. CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources, Vol. 3, No. 080, 18 pages.

USDHHS/USDA – U.S. Department of Health and Human Services and U.S. Department of Agriculture (**2005**) *Dietary Guidelines for Americans*. 6th Edition, Washington, DC: U.S. Government Printing Office, January 2005.

ANNEX 1. HPAI-related International Financial Assistance

(Up to December 2007)

Organization (Donor)	Amount in US$
Japanese Cooperation Agency	239,214
FAO (USAID)	88,000
UNICEF	2,100,000
CARE – Myanmar (AusAID)	37,333
DLD (Thailand)	100,000
AusAID (Australia)	67,185
Republic of Korea	14,000
FAO (World Bank)	20,240
P. R. of China	71,099

Source: Kyaw, 2008.

ANNEX 2. Details of Human HPAI Case in Myanmar, 2007

14 December 2007 - The Ministry of Health in Myanmar has confirmed the country's first case of human infection with the H5N1 avian influenza virus. The case is a 7-year-old female from Kyaing Tone Township, Shan State (East).

The case was detected through routine surveillance following an outbreak of H5N1 in poultry in the area in mid-November. She developed symptoms of fever and headache on 21 November 2007 and was hospitalized on 27 November. She has now recovered. Samples taken from the case tested positive for H5N1 at the National Health Laboratory in Yangon, and the National Institute of Health in Thailand. The diagnosis was further confirmed at the WHO Collaborating Centre for Reference and Research on Influenza, National Institute of Infectious Diseases in Tokyo, Japan.

Source: WHO, Epidemic and Pandemic Alert and Response (EPR), Avian Influenza Disease Outbreak News, 2007.

ANNEX 3. Myanmar Poultry Population by State/Division, 2006 – 2007

No.	State/Division	CHICKENS		DUCKS		TURKEYS/GEESE/MUSCOVIES		QUAILS	
		Owners	Numbers	Owners	Numbers	Owners	Numbers	Owners	Numbers
01	Kachin	73,162	3,187,854	17,587	159,907	1,709	45,532	n/a	n/a
02	Kayar	15,974	1,140,074	886	12,930	898	7,826	n/a	n/a
03	Kayin	79,552	2,349,011	23,393	215,843	3,397	32,689	n/a	n/a
04	Chin	68,667	1,898,997	2,364	22,650	690	6,829	n/a	n/a
05	Sagaing	321,240	8,446,472	14,268	187,604	2,117	42,544	38	43,386
06	Ttanintharyi	194,650	2,983,125	28,345	330,670	3,540	26,345	n/a	n/a
07	Bago East	116,552	5,445,104	32,135	2,348,872	15,431	63,909	n/a	n/a
08	Bago West	174,764	5,956,600	33,832	568,430	10,075	41,656	n/a	n/a
09	Magway	352,864	10,518,101	7,814	113,273	957	9,287	n/a	n/a
10	Mandalay	249,020	9,163,989	19,713	282,630	6,775	48,906	46	160,950
11	Mon	75,872	3,495,019	23,425	739,086	12,173	59,305	n/a	n/a
12	Rhakine	119,661	3,709,118	23,013	212,199	5,317	44,152	n/a	n/a
13	Yangon	277,382	15,302,342	46,534	1,861,205	9,612	194,778	150	176,838
14	Shan South	67,426	3,973,446	4,880	73,450	1,864	30,692	n/a	n/a
15	Shan East	42,618	1,039,224	8,947	111,764	262	6,307	n/a	n/a
16	Shan North	55,037	3,821,199	6,686	74,834	2,127	7,588	3	9,680
17	Ayeyarwady	437,906	11,306,912	171,213	2,782,633	5,739	387,592	31	9,000

Source: Myanmar's Central Statistics Organization, 2006 – 2007; n/a = not available.