



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

# Analysis of the Philippine Chicken Industry: Commercial versus Backyard Sectors

Hui-Shung (Christie) Chang

School of Economics, University of New England, Australia

E-mail: [hchang@une.edu.au](mailto:hchang@une.edu.au)

## ABSTRACT

*The chicken industry in the Philippines has diverse components. The commercial sector is characterized by large-scale, industrialized production systems of broilers and layers of exotic hybrids. On the other hand, the backyard sector is made up of many smallholders who keep a few native or crossbred chickens mainly for their own consumption. The backyard sector is worth a separate investigation because it differs from the commercial sector in terms of production and marketing issues and has, so far, received less attention from researchers and policymakers.*

*This paper identifies key issues and provides policy implications for both sectors. In the main, the commercial sector faces serious threats from global competition and its future depends largely on access to cheap inputs and improvements in production and marketing efficiency. Although not yet threatened by trade liberalization, the backyard sector suffers from low productivity and high mortality rates because of lack of technical know-how and access to key inputs. Its future depends on identifying and removing constraints to subsistence backyard production.*

## INTRODUCTION

Research on meat production worldwide indicates that poultry is the fastest growing livestock sector, especially in the developing countries (Delgado et al. 1999; Taha 2003; Landes et al. 2004; Conroy 2004). The Philippines is no exception (Costales et al. 2003). The outlook for the Philippine chicken industry appears optimistic because the demand for chicken products is expected to increase, along with population and income growth (DA and NAFC 2002a, b). Productivity improvements and developments in marketing infrastructure, such as the expansion of food processing, the modernization of the retail sector (e.g., growth in supermarkets and hypermarkets), and increasing refrigeration ownership, are additional drivers for future demand growth (Livestock Development Council 2002; DA and NAFC 2002a, b). However, there are increasing concerns about the threats from imports due to the more liberalized trade policies (Gonzales 1995; Mangabat 1998; Mateo 2001; Arboleda 2001).

As in most countries, and for many years, the Philippine poultry industry (including chickens

and ducks) has been protected from foreign competition through tariffs and other non-tariff measures. However, the forging of trade agreements in both global (e.g., World Trade Organization) and regional forums (e.g., Asia-Pacific Economic Cooperation and ASEAN Free Trade Area) since the mid-1990s has resulted in the lowering of tariffs and the removal of quantitative restrictions on agricultural products. Imports of poultry products (mainly frozen chicken leg quarters and offal) have increased substantially. It is envisaged that as trade barriers are reduced further, the Philippine poultry industry will face increasing competition from overseas. The continuing survival and growth of the Philippine poultry industry therefore depends on its ability to compete in the global market, which, in turn, depends largely on the efficiency of its production and marketing systems.

A number of studies have looked at the impact of trade liberalization on the commercial poultry sector in the Philippines. In most cases the Philippine commercial poultry sector was found to be high-cost producers and hence uncompetitive in a more liberalized trade environment (e.g.

SEARCA 1999; SIKAP/STRIVE 2001; DA and NAFC 2002a, b; Delgado et al. 2003; Costales et al. 2003). However, to date, little attention has been given to the backyard poultry sector and little is known about how it will be affected by trade liberalization.

The backyard poultry sector, which is defined by the Bureau of Agricultural Statistics (BAS 1987) as having less than 100 birds per household, deserves more attention because it comprises the majority of the poultry inventory in the Philippines. For example, the backyard production of native chickens accounted for about 54% of the total chicken inventory in 2005 (BAS 2006a), while backyard duck production accounted for about two-thirds of total duck inventory (BAS 2006b). It is also worth a separate investigation because it differs from the commercial sector not only in terms of the scale of operation but, more importantly, the respective production and marketing issues. Therefore, a clear distinction is made between the commercial and backyard operations in this paper, with a focus on future developments in the chicken meat industry.<sup>1</sup> The objectives of the paper are to identify the issues and opportunities facing the Philippine chicken meat industry and to suggest policy responses for both the commercial and backyard sectors. The analysis is based on a survey of the literature; secondary data; informal discussions with farmers, researchers and policymakers; and lastly, the author's personal observations from field trips. The paper is organized as follows. First, an overview of the production and consumption of major meat products is provided. Second, the commercial and backyard sectors are defined in the Philippine context. Problems and opportunities facing the commercial and backyard sectors of the chicken industry are then identified, followed by policy recommendations and concluding remarks.

## MEAT PRODUCTION AND CONSUMPTION

Over the period 1991–2004, all major meat products in the Philippines exhibited output growth (see bottom of Table 1). Specifically, chicken meat showed the highest growth rate at 6.18% per annum, followed by pork (3.49%) and beef (3.39%).<sup>2</sup>

Chicken meat is the second most popular meat in the Philippines, following pork. It can be seen from Table 2 that in 2004 the annual per capita pork consumption was 13.67 kg, followed by chicken meat (8.26 kg), and beef (2.21 kg). Per capita consumption for chicken meat, pork, and beef over the period 1991–2004 grew by 4.33%, 1.54%, and 2.67% for chicken meat, pork and beef, respectively. The demand for chicken meat is increasing faster than that of other meats, as observed elsewhere in the world, because of its many advantages, namely, its lower price, lower fat content, and the more convenient and versatile methods of meal preparation, compared to other meats (Landes et al. 2004).

However, per capita chicken meat consumption in the Philippines is low relative to that of neighboring Asian countries. For example, the annual per capita chicken meat consumption in 2004 was 13.52 kg and 37.59 kg in Thailand and Malaysia, respectively, compared to 8.20 kg in the Philippines (Abuel-Ang 2005). High retail prices, relative to household incomes, were cited as the main reason behind the relatively low demand (DA and NAFC 2002a, b).

Basic demand theory suggests that the demand for a product depends on its own price, the prices of substitutes and complements, income, demographics and consumer preference, as well as occasional shocks to the system such as FMD (foot-and-mouth disease) and bird flu outbreaks. A number of meat demand studies have found that the demand for chicken meat has been increasing because it has become cheaper relative to other

<sup>1</sup> The distinction between the backyard and the smallholder sector is important here. While backyard production is defined by BAS (1987) as having less than 100 birds, the smallholder sector has not been officially defined. Often, the latter refers to relatively small commercial farms. For example, Costales et al. (2003) define smallholders as having less than 10,000 heads while SEARCA (1999) and SIKAP/STRIVE Foundation (2001) define small farms as having less than 1000 birds. All of these are applied to commercial broiler farms based on exotic hybrids.

<sup>2</sup> Annual compound growth rate,  $r$ , is calculated based on the formula:  $r = [(y/x)^{(1/n)}] - 1$ , where  $x$  and  $y$  are the first and the last observations during the observation period, respectively, and  $n$  is the number of years being considered.

**Table 1. Volumes of meat production by product type (in tons), 1991–2004**

Year	Chicken	Pork	Beef
1991	286,874	845,213	112,407
1992	356,398	845,250	115,595
1993	364,481	880,945	125,894
1994	376,607	921,761	135,506
1995	399,651	969,862	147,463
1996	455,097	1,036,517	NA
1997	496,686	1,085,544	NA
1998	491,227	1,123,773	182,723
1999	496,429	1,171,759	189,934
2000	533,118	1,212,536	190,159
2001	587,067	1,265,888	182,887
2002	627,105	1,332,347	182,814
2003	635,132	1,384,575	180,967
2004	663,759	1,365,606	179,229
<b>Annual growth rate</b>	<b>6.18%</b>	<b>3.49%</b>	<b>3.39%</b>

Source: BAS, 2005.

**Table 2. Per capita consumption of meat products (in kg), Philippines, 1991–2004**

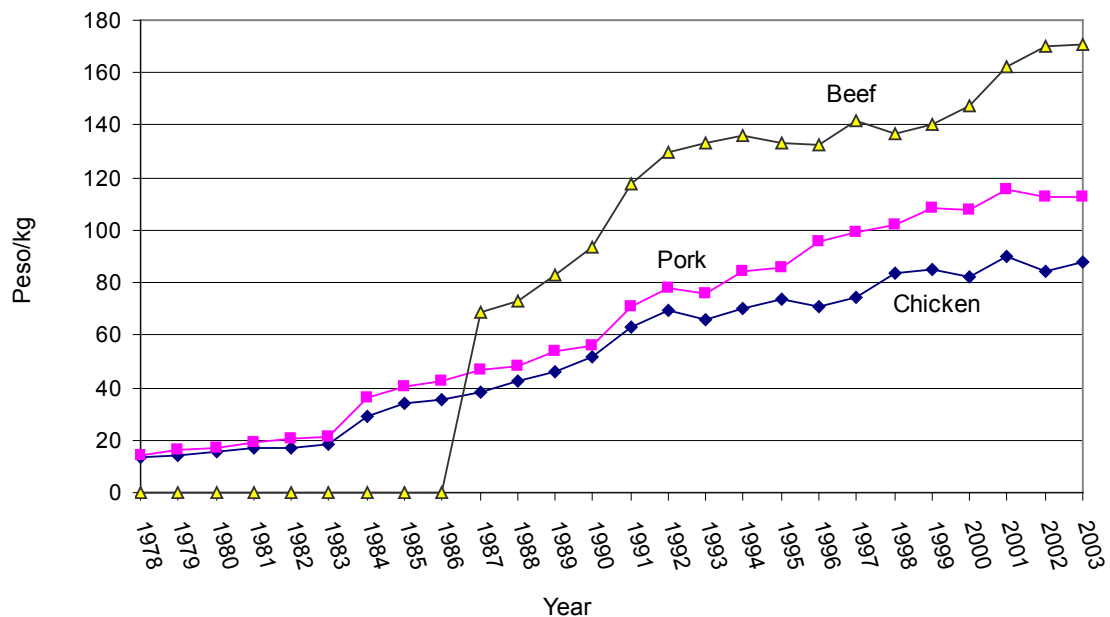
Year	Chicken	Pork	Beef
1991	4.56	11.03	1.53
1992	5.55	10.79	1.60
1993	5.57	11.04	1.74
1994	5.49	11.02	1.90
1995	5.85	11.65	2.03
1996	6.51	12.21	NA
1997	6.96	12.54	NA
1998	6.75	12.69	2.32
1999	7.03	13.10	2.43
2000	7.20	13.35	2.46
2001	7.68	13.51	2.17
2002	8.04	13.85	2.16
2003	8.00	14.12	2.12
2004	8.26	13.67	2.21
<b>Annual growth rate</b>	<b>4.33%</b>	<b>1.54%</b>	<b>2.67%</b>

Source: BAS, 2005.

meats (Taha 2003; Landes et al. 2004; Conroy 2004; Fabiosa et al. 2004). Some suggest that it is a result of income growth and urbanization (e.g. DA and NAFC 2002a; Costales et al. 2003; Delgado et al. 2003).

Others have argued that the increased demand for chicken is a result of a growing consumer preference for chicken (Chalfant and Alston 1998; Gao and Shonkwiler 1993; Eales and Unnevehr

1993; Chavas 1983). More recently, food safety, environmental and animal welfare concerns have also become important considerations in meat consumption (Dahlgran and Fairchild 1987; Flake and Patterson 1999; Burton and Young 1999; Piggott and Marsh 2004; Aho 2004). To learn more about whether and why the demand for meats has changed over time in the Philippines would require a demand systems analysis to determine consumer



**Fig. 1. Retailment prices in Metro Manila, 1978–2003**

responses to changes in prices and income, as well as changing demographics and eating habits, as suggested in Deaton and Muellbauer (1980).

Nevertheless, based on experiences overseas, as referenced above, it is reasonable to make the following predictions for the Philippines. First of all, the demand for chicken, pork and beef will increase as income grows, but with chicken meat experiencing faster growth (Taha 2003). Secondly, the demand for chicken meat may increase significantly in the near future at the expense of pork as chicken price becomes cheaper relative to pork. The retail prices of the three most popular meats in the Philippines, namely, pork, chicken, and beef, in the past two decades (1978-2002) are shown in Figure 1.<sup>3</sup> It is evident that beef is the most expensive, followed by pork and chicken. Thirdly, some of the increases in meat demand may be filled by imports that are cheaper to produce overseas. This is particularly true for beef for which the Philippines does not have a comparative advantage in production and border protection is relatively weak. In 2004, 21% of total beef supply came from imports (BAS 2005).

## COMMERCIAL VERSUS BACKYARD PRODUCTION

The poultry inventory in the Philippines is classified into “commercial” and “backyard”. A poultry farm is classified as “commercial” if it has more than 100 birds (BAS 1987). Otherwise, it is classified as “backyard”. Based on this definition, backyard production of (native) chickens accounted for more than 50% of the total chicken inventory in the Philippines in 2005 (BAS 2006a).

This definition of the backyard sector is similar to the description of “Sector 4” in the classification drawn up by the Food and Agriculture Organization (FAO). FAO (2004) categorizes poultry farms into four sectors based on their ability to institute bio-security measures against the infestation and spread of diseases, particularly the avian influenza (AI). The four sectors are: Sector 1 – Industrial integrated production system; Sector 2 – Commercial poultry production system; Sector 3 – Semi-commercial poultry production system; and Sector 4 – Village or backyard production.

<sup>3</sup> Note that beef prices are not available prior to 1987

Classified under Sector 4 are backyard farmers who keep, on average, between 10 and 20 birds and typically less than 50 birds. It is the most dominant category in terms of number of farmers and the share of total production especially in the developing countries (Agrifood Consulting International 2006). For example, more than 70% of Vietnamese households and 95% of poultry farms fall into this category. Backyard poultry is often referred to as family poultry (Branckaert and Gueye 1999; Conroy 2004) or (scavenging) village chickens in the case of chicken (Alders and Spradbrow 2001; Lambio 2005). The common, and most significant, feature of backyard poultry is the low-input, low-output production system which is based almost entirely on native birds and local breeds (FAO 2000). Chickens raised under this system are generally utilized for home consumption and, when necessary, as source of additional income (Conroy et al. 2005; Lambio 2005).

By comparison, the commercial sector is characterized by large-scale and integrated production and marketing systems (SEARCA 1999; SIKAP/STRIVE Foundation 2001; Costales et al. 2003), as described in FAO Sectors 1 and 2. Based on current definitions (SEARCA 1999; SIKAP/STRIVE Foundation 2001), the Philippine broiler sector is characterized by:

- modern foreign breeds from the Western countries;
- the use of vaccines and drugs to control diseases and promote growth;
- the use of advanced technology to raise chickens on a large scale; and
- a vertically integrated production system based largely on contract farming.

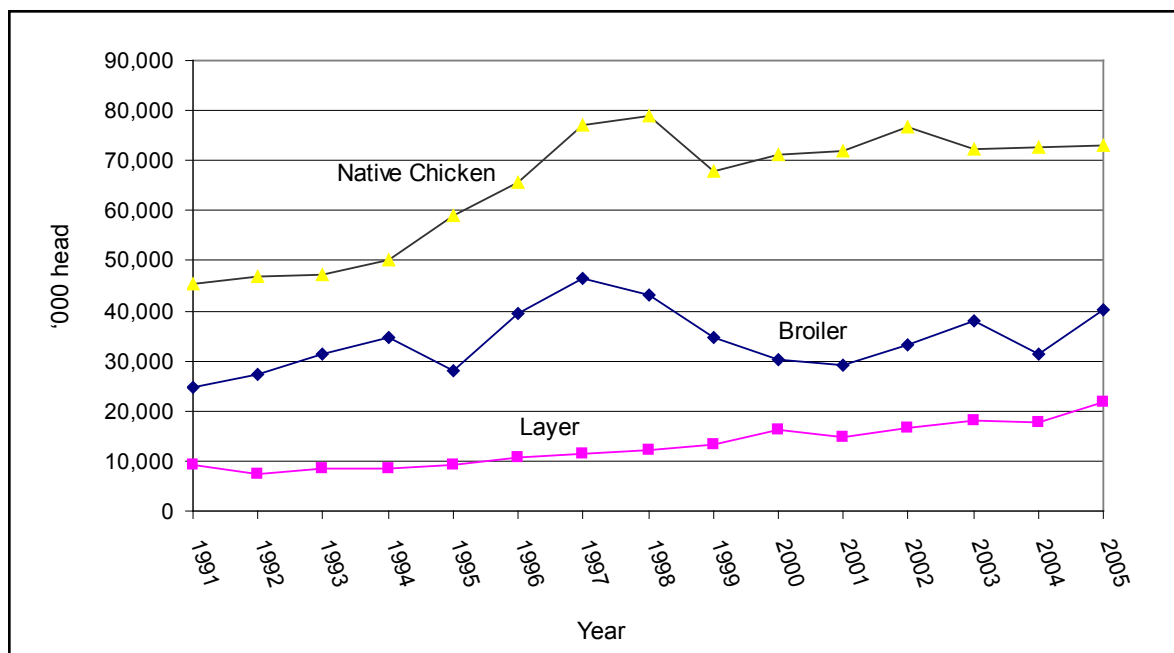
The Philippine broiler industry is controlled by four major integrators, namely: Swift Foods, San Miguel Foods, Tysons Agro-Ventures, and Universal Robina Corporation; together, they account for 65% of the total broiler supply in the country (Abuel-Ang 2005). These integrators are involved in the production and marketing of broiler chickens, the importation of grandparent and parent stock, and the manufacturing and sales of commercially mixed feeds and breeder stocks to independent raisers. The integrators are organized into the Philippine Association of Broiler

Integrators. On the other hand, the small- and medium-scale commercial broiler and independent poultry producers, particularly from Rizal, Bulacan, Cavite, Laguna, Pampanga and Tarlac have grouped themselves into the United Broilers' Association (DA-AMAS 2001).

In addition to the classification based on the size of the operation, the Philippine chicken inventory is classified into "native", "broiler" and "layer", based on breeds and purposes. Layers and broilers are imported hybrids with foreign strains. Native chickens, on the other hand, refer to the local breeds as well as the so-called "improved breeds" that are crosses of local chickens with foreign strains. Prior to 1998, layer and broiler chickens were lumped together in BAS statistics as "commercial" chickens, while native chickens were referred to as the "backyard" variety. Because of the loose definition and the diversity of the poultry production systems, it is conceivable that some "commercial" chickens are actually raised in backyards, while some native chicken farms have more than 100 birds. It appears that the current classification systems may need to be revised to reflect more clearly the key characteristics of the production systems.

Chicken inventories by type during 1991–2005 are shown in Figure 2. It can be seen that while the number of layers has increased steadily over the period, the stocks of native chickens and broilers have shown a great deal of variations. Nevertheless, the growth rates over the period were 3.37%, 5.77% and 3.22% for broiler, layer and native chickens, respectively.

In 2005, the inventory consisted of 54% native chickens, 30% broilers and 16% layer chickens. Therefore, the commercial sector (broilers and layers) and the backyard sector (native chickens) had almost equal shares in terms of number of chickens. However, the output shares from the commercial sector are disproportionately higher. In 2005, the share of commercial broilers in total chicken meat production in the Philippines was estimated at 67%, with native chickens accounting for only 13% (Abuel-Ang 2005). Similarly, commercial layers accounted for 74% of the total table egg production while native/improved chickens accounted for the remaining 26% (BAS 2006a). The fact that native chickens are used both for meat and egg production should be taken into consideration when assessing



**Fig. 2. Population of Chicken by Type, 1991-2005**

this sector's productivity and contribution to the poultry economy.

Commercial broiler farms in the Philippines are geographically concentrated. In 2005, Central Luzon (33.2%) and Calabarzon (28.2%) accounted for 61.4% of total broiler stocks in the country (BAS 2006a). These two regions also accounted for more than 50% of total layer stocks in the Philippines. The domination by a few leading producing regions reflects the comparative advantage they all share in terms of access to major inputs and markets (Costales et al. 2003). Although such a high degree of geographical concentration has its advantage in the marketing and sourcing of inputs, it presents significant challenges to on-farm disease control and waste management. A disease outbreak, such as the bird flu which has plagued a number of poultry-producing countries worldwide in recent years,<sup>4</sup> can be disastrous, given its potential to wipe out the entire industry in a very short time.

Native chicken production, on the other hand, is more widespread, but most prominent in Western Visayas (14.1%), Central Visayas (9.4%), Cagayan Valley (7.9%), Southern Mindanao (7.9%) and Ilocos Region (7.5%); together they accounted for 47% of total native chicken inventory in 2005

(BAS 2006a).

## ISSUES IN THE COMMERCIAL SECTOR

The Philippine broiler sector has shown continuing growth since the introduction of modern technologies in the 1960s and the demand outlook appears positive for the Philippine chicken meat industry, given its current low level of per capita consumption and anticipated income and population growth. However, there are major issues facing the commercial sector, including market instability, high input costs, inefficient marketing systems, and threats of imports. In addition, like many other commercial chicken sectors in the world, the Philippine broiler sector faces increasing consumer demand for food safety and product quality, and public concerns over animal welfare and the environmental impact associated with industrialized poultry production.

### *Market Instability*

It can be seen in Figure 2 that fluctuations in broiler stocks are quite substantial from year to year. Although this issue is relatively complex to sort out,

<sup>4</sup> Unlike its neighbors, the Philippines has not been affected by the recent bird flu outbreaks.

SEARCA (1999) has offered some explanations. It was suggested that fluctuations in supply are a result of relatively short broiler production cycles and the lack of planning on the part of the industry as a whole. While the short production cycles enable the broiler sector to respond more quickly to changing market conditions, it can also exacerbate the imbalance of demand and supply, especially when the market is misjudged. For example, in 1995, two million breeder chicks (including grandparent and parent stocks) were imported in response to the FMD outbreaks in 1994 and 1995 (SIKAP/STRIVE Foundation 2001). However, the anticipated demand increase did not materialize. Over-expansion had resulted in over-production in 1996 and 1997, thus bringing about low prices, to the detriment of the less efficient, and often less capitalized, operations which suffered financial losses.

Again, in 2000 1.7 million breeder stocks were imported (Livestock Development Council 2002). In more recent years, the number of breeder stocks imported, in terms of thousand heads, totaled 1,908 in 2002, 1,101 in 2003, 487 in 2004, and 561 in 2005 (BAS 2006a). The end result is the boom-and-bust cycle, characterized by fluctuating outputs and prices. It appears that market stability can be improved through better industry planning based on more reliable and timely market forecasts, and closer cooperation in information sharing among industry participants, and between the industry and the government.

### ***High Input Costs***

Although modern technology has increased productivity significantly compared with more traditional production methods, it has, however, made the industry heavily dependent on imported inputs, including breeder stock, veterinary supplies, equipment, and feedstuffs. Feed costs and Day-Old-Chicks (DOCs) make up 68% and 25% of the total cost of intensive broiler production, respectively (Gonzales 1995). Therefore, lowering input costs has been singled out as the most important factor for improving global competitiveness (Arboleda 2001; Mateo 2001; DA and NAFC 2002a, b). High input costs have been exacerbated by the continuing devaluation of the Philippine peso in recent years, which had made imported goods more expensive.

Moreover, the input markets are subject to government intervention. Take corn, for example. Although corn is the Philippines's third largest crop, following rice and coconut, the sector is inefficient and corn is expensive because of the existing price support and import licensing policies (Mendoza and Rosegrant 1995). Since the early 1970s, the National Food Authority (NFA) has manipulated the local supply of corn by the direct procurement and disbursement of buffer stock. It likewise controls the importation of corn through import licenses. Under the import-licensing scheme, the NFA determines the volume and the timing of corn importation; imports are then allocated among qualified, licensed local corn processors and livestock and poultry raisers. In many instances, importers have complained about the misuse of authority by the NFA, which, they claimed, resulted in limited corn imports and higher prices (Pabuayon 1985). Nominal rates of protection for corn in the early 1990s were as high as 40–50% (Rosegrant et al. 1992). Corn supply is, therefore, seen as a major issue for the commercial poultry industry because of its impact on feed costs and, hence, on cost competitiveness (Mojica-Sevilla 2005). Habito (2002) went as far as to conclude that achieving international competitiveness in poultry production was inextricably linked to achieving international competitiveness in corn production.

Cost competitiveness is especially important for intensive broiler production because most producers use basically the same technology and there is little room for product differentiation. As a result, production cost becomes the basis for determining competitiveness and profitability. The reliance on imported inputs means that a strong Philippine peso and access to cheap inputs are crucial for improving global competitiveness, particularly when the world's major broiler producers and exporters such as the United States, Brazil and Thailand all have ready access to feeds and breeder stock.

### ***Inefficient Production***

According to industry sources, the integrators have attained only 70% of the international efficiency standards and there is a need to adopt the latest technology in poultry raising, particularly in the areas of environmental control and automation in feeding, drinking and other management



practices (DA-AMAS 2001). In Table 3, the on-farm performance of the Philippine broiler industry is assessed against those of the United States, China, Thailand and Brazil, all of which are major broiler producers in the world market. As can be seen, the Philippine broiler industry is on a par with the world's best practices in terms of livability, but is slightly below par in terms of feed conversion ratio (FCR). Production inefficiency, along with the reliance on high-cost imported inputs, has resulted in a higher production cost of live birds, which is 42% higher than in the United States and Brazil.

Another reason for the higher production cost is consumer preference for smaller carcasses (around 1.0–1.2 kg dressed weight for a whole chicken, compared to 1.5 kg in other countries) (DA and NAFC 2002a, p. 26). The demand for smaller carcasses means that broiler growth is not allowed to reach its peak feed efficiency (normally at around 1.9 kg live weight), resulting in a small average weight per bird and hence higher cost per kilogram of meat.

As shown in Table 3, dressed birds at the wholesale/retail level in the country are 55% more expensive than in the United States, Brazil and Thailand. The higher wholesale and retail prices are due to the inefficiency existing in the marketing chain, especially processing and distribution (for details, see DA and NAFC 2002a, b).

### *Inefficient Marketing Systems*

Despite the highly concentrated and vertically integrated production structure of the commercial

broiler sector, about 70% of broilers are sold through the wet markets either as live birds or freshly slaughtered because of consumer preference for fresh meat (Abuel-Ang 2005). The three major market segments that are serviced by the integrators are: wet markets (50%), HRI (hotels, restaurants and institutions) (40%), and supermarkets (10%) (DA and NAFC 2002a). By contrast, the small- and medium-scale independent broiler producers sell to the live chicken traders or *viajeros*/traders who then on-sell the chickens, either live or dressed, to retailers in the wet markets and restaurants (DA-AMAS 2001).

The diversity of, and the involvement of many small traders and retailers in, the marketing channels mean that the broiler marketing system does not benefit fully from the economies of scale that exist in the industrialized production system. However, the current marketing system is likely to change in the foreseeable future for two reasons. Firstly, the marketing of live birds has a few disadvantages, namely: 1) it increases the risk of the spread of diseases; 2) it increases the probability of bruising on the carcass, weight loss, and death during shipping and handling; 3) it increases food safety risks because of the lack of hygienic facilities and practices in wet markets; and 4) it increases costs because of fragmented, small-scale operations. Secondly, despite the preference for fresh meats and shopping at wet markets, over time, the trend has been for consumers, especially city dwellers, to shop at supermarkets and store perishable commodities such as poultry meat in refrigerators (Taha 2003).

**Table 3. Cross-country comparisons of broiler production**

Country	On-farm productivity		Production cost (in Philippine pesos/kg)	
	Livability (%)	FCR	Live weight	Dressed weight
Philippines	95	1.90	34	51
USA	95	1.85	24	33
China	93	2.00	--	--
Thailand	95	1.85	26	33
Brazil	95	1.85	24	33

Source: PABI (cited in SIKAP/STRIVE Foundation, 2001).

### ***Public Concern over Industrialized Livestock Production Systems***

Technological advances in broiler production have contributed greatly to the popularity of broiler meat worldwide. However, there has been a steady rise in government regulations on, and consumer dissatisfaction with, industrialized poultry production systems (McMullin 2003). Of particular concern are:

- the use of antimicrobial growth promoters, animal protein and genetically modified materials in feeds;
- the impact on the environment;
- animal welfare; and
- disease control.

Obviously, meeting these additional requirements from the consumer and the government will have significant implications for the future cost of production and market competition (Ellendorff 2003).

The Philippine broiler sector was found to be internationally uncompetitive because of higher input costs, below-par on-farm productivity, and an inefficient marketing system (DA and NAFC 2002a, b; SEARCA 1999; SIKAP/STRIVE Foundation 2001). Therefore, threats from foreign competition had surfaced as a major concern when the Philippines became a member of the WTO in the mid-1990s. In 2005, chicken meat imports reached 26 thousand tons, valued at US\$14.5 million FOB (free-on-board) (BAS 2006a), which is a significant jump from around 200 tons per year between 1993 and 1996 at the start of trade liberalization. Improving both production and marketing efficiency is necessary to become more competitive internationally and will require coordinated efforts from both the private and public sectors.

### **ISSUES IN THE BACKYARD SECTOR**

Generally, the backyard chicken sector is less productive. That is, native chickens have slower growth rates, lower laying rates, and higher mortality rates than their broiler counterpart

because of primitive production systems and management practices (e.g., Devendra 1993; FAO 2000; Alders and Spradbrow 2001; Conroy 2004). In addition, the quality and supply of outputs from the backyard sector are inconsistent due to heterogeneity in genotype and production system. Access to market is another important issue facing the backyard sector. These are the same issues facing the Philippine backyard sector (Lambio et al. 2003; de Castro et al. 2003; Lambio et al. 2004; Lambio 2005).

Rural households in the Philippines, like their counterparts in other developing countries, often keep a small number of chickens in their backyards (5–10 hens and 1–2 roosters with varying number of growers) on free-range system (scavenging) as a means to supplement their household incomes and nutritional needs (Lambio 2005). Based on farm surveys in Batangas and Iloilo, Lambio (2005) reported that the average flock size was 18 heads for Batangas (ranging from 3 to 57 heads) and 24 heads for Iloilo (ranging from 4 to 130 head). In addition, he found that for the majority of farmers interviewed, native chickens were raised for their meat, eggs (but much less so than meat) and manure; as gifts for visitors; and to provide additional income. Often, they only sell their produce when there is a need for cash. This result is consistent with what is reported for India by Conroy et al. (2005). Therefore, the reason for keeping native chickens is more for subsistence than for commercial purposes.

Also, family poultry was found to be only a small component of a highly diversified, multi-sectoral agro-ecosystem (Lambio 2005). That is, native chickens are often raised alongside ducks, goats, pigs, carabaos and other livestock, while farm income is supplemented by income from handicrafts, trade, wage labor and remittances. Finally, native chicken eggs and meat are preferred by consumers and command a price premium (often three to four times) over their commercial counterparts because of their distinct flavor, taste and texture (Lambio 2005). These findings suggest that the issues facing the backyard sector, as elaborated on below, are significantly different from those in the commercial sector, and thus require different strategies to resolve them.

### ***Low Productivity***

Backyard poultry production utilizes very little resources; as a result, output and productivity are generally low. The poultry are often raised under primitive conditions, without any housing, and survive by scavenging for naturally occurring feeds (grasses, insects, worms and other edible plants and animals), fallen grains, and household refuse (Lambio 2005). There is also no systematic breeding or management. Therefore, the backyard sector tends to suffer from disease, insufficient feeding, lack of housing, and no selective breeding (Dwinger et al. 2001; Minga et al. 2001; Conroy 2004; Lambio et al. 2004). It has been observed that native chickens raised under scavenging system normally produce on average 10 to 15 eggs about three to four times a year and weigh between one to one and a half kilograms at about 18 weeks of age (Lambio et al. 2004). In contrast, commercial layers can lay about 280 eggs a year consistently and commercial broilers reach 1.9 kilograms consistently at six weeks of age.

Another reason for the low productivity is that advances in technology do not benefit backyard raisers, most of whom lack access to important inputs, such as commercial feeds, high quality stock, credit, and extension services (Lambio et al. 2003; Chang et al. 2006; Conroy et al. 2005). On the other hand, studies on rural poultry development have found that rural households are often not interested in extension service or new technology for several reasons. Firstly, there is little incentive for them to actively seek improvement because there is little to gain from a very small production base. Secondly, they may not have the resources to invest in any improvement even if they want to because of the lack of access to credit. Illiteracy and low education are additional barriers to adoption (de Castro et al. 2002). Although the issue of not adopting new technology can be quite complex, the lack of resources to act upon the advice is often cited as a main reason for not adopting new technology.

### ***Inconsistent Quality and Supply***

The most significant difference between the backyard and the commercial poultry sectors may be the diversity of the backyard sector. As

discussed earlier, the commercial poultry sector is supported basically by the same technology (including breeds and management practices) that is available worldwide with a sole focus on production efficiency. The backyard production systems, on the other hand, vary greatly from region to region depending to a large extent on local conditions and grower preference. This diversity means that there are many different breeds, utilizing a variety of feed sources, and management practices. This diversity inevitably results in variable product quality and inconsistent supply. Both of these are serious issues for contemporary marketing in terms of meeting market demand for consistency in supply and product quality. Currently, native chickens are sold mostly at the farm gate (when approached by traders) and in the local markets (either by farmers themselves or through assembler-wholesaler and retailers) (de Castro et al. 2003). However, the rapid rise of supermarkets in developing countries, including the Philippines, is likely to become a serious threat to the backyard sector in terms of market access (Reardon et al. 2004). Other marketing issues facing the backyard poultry producers are: access to market and market information, high transaction costs, and poor bargaining position (Costales et al. 2003). All of these make them susceptible to exploitation by unscrupulous traders.

### ***Threats from the Commercial Sector***

Backyard poultry production has come under more intense scrutiny due to the recent avian influenza (AI) outbreaks (Rushton et al. 2005). The sector was suspected of serving as a reservoir for disease spread. To prevent future disease outbreaks, increased restrictions are likely to be imposed on informal smallholder poultry production (Aho 2004). In the foreseeable future, it is likely that backyard poultry production will be either actively discouraged or phased out in some areas or relegated to the poorest and most isolated areas. If implemented, these policies will result in the displacement of smallholder production and quicken the structural change in the poultry industry. Any policy changes should carefully take into account the economic and social impact on smallholder producers and their livelihood.

Generally, native breeds have relatively low productivity in terms of weight gain, size, body weight, and maturation time. However, the backyard sector does have some marketing advantages. Firstly, backyard production has low input requirements, which keep cost down. The slow growth rate, although a drawback, has the benefit of producing a carcass that has a unique flavor, texture and taste — qualities that are sought after by a significant segment of the market (Fujimura et al. 1994; Gueye et al. 1997; World Poultry 2004; Lambio 2005). This is particularly true in Asia and Africa where native chickens command premium prices and are often in short supply (Kitalyi 1996; Alders and Spradbrow 2001; Taha 2003; Landes et al. 2004; Lambio 2005).

Secondly, because most backyard poultry production uses little or no veterinary medicines or other substances, its output is much more “natural” than the products from the industrialized production systems. Natural products, such as free-range and organic chickens, have gained recognition and support from consumers worldwide in recent years (World Poultry 2004). Therefore, the backyard sector does not appear to be threatened by trade liberalization, as does the commercial broiler sector. This is because its production is mainly for own consumption and there is not enough marketable surplus to satisfy demand, as evident in the premium prices native chickens command over broilers.

## POLICY IMPLICATIONS

Based on an overview of the world broiler industry, Chang (2005) showed that the world broiler market is highly competitive, with an increasing number of efficient producers fighting for market share. Major broiler exporters, such as the United States, Brazil and Thailand, succeed in the international market by competitive pricing, aggressive marketing, and new product development. Their successes are based on well-managed and coordinated supply chains that meet changing consumer demand and increasing government regulations. To combat the threat of imports from the big players, the Philippine broiler industry must address the issues identified in this paper. This will require the industry to improve on-farm productivity by adopting the latest technology and better management practices.

In addition, there appears to be a need for the industry to become fully vertically integrated to benefit more from the economies of scale and scope. This will involve integrating backward to producing its own breeder stock and integrating forward into further processing and distribution. Innovative processing and marketing are crucial in order to change consumers' preference for small and fresh carcasses and to lure them away from the live trade and wet markets. In addition, the Philippine poultry industry is fortunate not to be affected by the recent AI outbreaks. The AI-free status has obviously provided a marketing advantage in the short term by opening up some export markets. However, to maintain this marketing edge, the industry must commit to tighter bio-security measures and to improving cost competitiveness. Finally, it must address the potential conflict between the commercial and backyard sectors particularly in terms of disease control (Aho 2004).

For the backyard sector, the key issue is to improve productivity. There are two policy options for productivity improvements for backyard poultry (Arboleda et al., 1985). One is based on the importation of breeder stock from overseas. This particular strategy had been tried before, both in the Philippines and overseas, but failed (Kitalyi 1996). The reasons for the failure are: first, the imported stocks are inappropriate either for backyard smallholder production or for Philippine conditions; second, they are input-intensive and possibly import-dependent; and third, they are too expensive for resource-poor smallholders (Department of Agriculture 2001). The other option is to select and upgrade existing native breeds. This strategy has gained more support from the Philippine government and the academe in recent years, mainly because it is less expensive and more suitable for local conditions (Department of Agriculture 2001). It also allows better utilization of local resources and conservation of local germplasm. Conroy (2004) also found that improving the traditional scavenging system based on native breeds was a better policy option than promoting an intermediate, semi-intensive system based on exotic breeds. The former has resulted in significant improvements in productivity and production and household incomes. For the local breed-based strategy to work in the Philippines, more research is needed to identify those breeds

that have the potential for productivity gain and to assess the availability and cost of local feed supplements on output. More research is also needed to understand the skill base of backyard poultry producers and to identify the target groups for extension and technical assistance.

It has been suggested that improving backyard smallholder production takes time and is best achieved by a four-stage approach (Kitalyi 1998). Stage I involves reducing mortality by improving hygiene, shelter, and disease control for backyard poultry. At Stage II, the focus is to improve feeding and nutrition by identifying locally available feed sources for supplementary feeding. Stage III aims at improving productivity through the selection of high-yielding traits and disease resistance that suit local conditions. When significant improvements are achieved in mortality and productivity, the next step at Stage IV is to consider upgrading backyard production to a commercial scale. This four-stage approach seems very appropriate for developing the Philippine backyard poultry sector because it is consistent with the policy objective of first improving the livelihood and food security of smallholders before proceeding to commercialize the backyard sector and link smallholders to the market.<sup>5</sup> That is, although commercializing native chicken production and linking backyard smallholders to markets have the potential to significantly improve their incomes, it should not be the main aim at present. Rather, the policy objective at present should focus on improving the livelihood and food security of the rural households by removing the constraints to subsistence backyard production. Finally, since smallholder backyard poultry production is often only a small part of a much diversified farming operation, any program aiming to improve the performance of backyard poultry production must also consider the impact on other components of the farm. Therefore, a whole farm approach, taking into account complementarity and competition between different farm activities, is necessary to achieve more effective policy outcomes.

## CONCLUSIONS

The Philippine poultry industry is very diverse. It comprises broiler chickens, layer chickens, native chickens and ducks. The production of broiler and layer chickens is characterized by large-scale, intensive, commercial production systems with modern technology and imported hybrids. Native chicken production, on the other hand, is usually a backyard activity undertaken by rural households using minimal inputs. It appears that the Philippine chicken meat industry, including broiler and native chickens, stands to benefit from an increase in demand because of the anticipated growth in population and household incomes. However, it faces a number of challenges.

For the commercial broiler sector, its main concern would be the threat from global competition because it is a high-cost producer by world standards and it is no longer protected by trade barriers. The future of the commercial sector will depend largely on the availability of cheap feed sources and improvements in production and marketing efficiency. It appears that in the longer term much improvement can be made by becoming fully vertically integrated. This will involve investments in breeding and genetic improvements to produce its own breeder stock and integrating forward into further processing and distribution. The backyard sector, on the other hand, is not directly affected by trade liberalization at the moment because most of its production is for home consumption by rural households and there are not enough market surpluses to meet the demand for native chicken. However, the backyard sector faces serious issues of low productivity and high mortality rates because of the lack of technical know-how and access to key inputs. The key recommendation here is to undertake more research that would identify not only the constraints to subsistence backyard production but also the means for effective extension and technical assistance.

---

<sup>5</sup> Although backyard chicken production has gradually been displaced by commercial exotic breeds and modern technology the world over, native chicken production has been successfully commercialized with improved genetics and management in countries like Taiwan, Thailand and China. Thailand is said to be gearing up to export native chickens in the foreseeable future.

## REFERENCES

- Abuel-Ang, P. 2005. Philippines: Poultry and Products Annual 2005. GAIN Report Number RP5033. FAS, USDA. <<http://fas.usda.gov/gainfiles/200509/146130789.pdf>>
- Agrifood Consulting International. 2006. "FAO Poultry Sector Rehabilitation Project—Phase 1: The Impact of Avian Influenza on Poultry Sector Restructuring and its Socio-economic Effects".
- Aho, P. 2004. "The Ripple from Avian Influenza – The Future of the World Poultry Industry". Poultry International, 43 (5): 30-34.
- Alders, R.G. and P.B. Spradbrow. (eds). 2001. ACIAR Proceedings No. 103. SADC Planning Workshop on Newcastle Disease Control in Village Chickens, held in Paptto, Mozambique, 6-9 March 2000., Canberra: ACIAR.
- Arboleda, C.R. 2001. "The Philippine Poultry Industry: Meeting the Challenges of the 21st Century". Paper presented to the 3rd 2001 PSAS Lecture Series on "The Philippine Poultry Industry in the 21st Century: Threats and Opportunities". National Agriculture and Fishery Council, Diliman, Quezon City, 17 May 2001.
- Arboleda, C.R., E.C. Coligado, A.S. Alejar, E.S. Luis, R.P. Novero, and S.S. Capitan. 1985. "Breeding and Management of Ducks for Meat and Egg Production". Terminal Report, NSTA-Assisted, Project No. 7901Ag (mimeo).
- Branckaert, R.D.S. and E.F. Gueye. 1999. "FAO's Programme for Support to Family Poultry Production". In the Proceedings of the Workshop on "Poultry as a Tool in Poverty Eradication and Promotion of Gender Equality". <[http://www.husdyr.kvl.dk/html/php/tune99/24\\_Branckaert.htm](http://www.husdyr.kvl.dk/html/php/tune99/24_Branckaert.htm)>
- Bureau of Agricultural Statistics (BAS). 1987. Backyard Livestock and Poultry Survey: Manual of Operations. Department of Agriculture. Diliman, Quezon City.
- \_\_\_\_\_. 2005. Supply and Utilization Accounts. Department of Agriculture. Diliman, Quezon City.
- \_\_\_\_\_. 2006a. Chicken Industry Performance Report, January-December 2005. Livestock and Poultry Statistics Division, BAS, Department of Agriculture, May 2006 <[http://www.bas.gov.ph/downloads\\_view.php?id=167](http://www.bas.gov.ph/downloads_view.php?id=167)>
- \_\_\_\_\_. 2006b. Duck Industry Performance Report. January-December 2005. Livestock and Poultry Statistics Division, BAS, Department of Agriculture. May 2006 <[http://www.bas.gov.ph/downloads\\_view.php?id=166](http://www.bas.gov.ph/downloads_view.php?id=166)>
- Burton, M. and T. Young. 1999. "The Impact of BSE on the Demand for Beef and Other Meats in Great Britain". Applied Economics, 28: 687-693.
- Chalfant, J.A. and J.M. Alston. 1998. "Accounting for Changes in Taste". Journal of Political Economy, 96: 391-410.
- Chang, H.S. 2005. "An Overview of the World Broiler Sector: Implications for the Philippines". Working Paper Series No. 2005-9 in Agricultural and Resource Economics, School of Economics, University of New England. <<http://www.une.edu.au/febl/GSARE/arewp05-9.pdf>>
- \_\_\_\_\_, N. De Castro, M.L. Malabayabas, C. Dagaas, R. Ranola, Jr., and A. Lambio. 2006. "Duck Marketing in the Philippines: Issues and Opportunities". Animal Husbandry and Agricultural Journal, 40: 16-30.
- Chavas, J.P. 1983. "Structural Change in Meat Demand". American Journal of Agricultural Economics, 95: 148-153.
- Conroy, C. 2004. "Livestock Sector Growth and Poverty, with Particular Reference to India". Natural Resource Institute <<http://dfid-agriculture-consultation.nri.org/theme1/keypaper/livestockrevolution.pdf>>
- Conroy, C., N. Sparks, D. Chandrasekaran, A. Sharma, D. Shindey, L.R. Singh, A. Natarjan, and K. Anitha. 2005. "Improving Backyard Poultry-keeping: A Case Study from India". Agricultural Research & Extension Network. Network Paper no. 146.
- Costales, A.C., C.L. Delgado, Ma. A.O. Catelo, M. Tiongco, A.C. Chatterjee, and A. Reyes. 2003. "Annex I: Livestock Industrialization Project: Phase II -- Policy, Technical, and Environmental Determinants and Implications of Scaling-up of Broiler and Swine Production in the Philippines". In C. Delgado, C. Narrod, and M. Tiongco. 2003. Policy, Technical, and Environmental Determinants and Implications of Scaling-up of Livestock Production in Four Fast-growing Developing Countries: A Synthesis. <<http://www.fao.org/WAIRDOCS/LEAD/X6170E/X6170E00.HTM>>

- Dahlgran, R.A. and D.G. Fairchild. 1987. "The Demand Impacts of Chicken Contamination Publicity—A Case Study. *Agribusiness*, 18: 459-474.
- Department of Agriculture. 2001. "Livestock & Poultry RDE Agenda & Program (2000-2004)". National Integrated Research Development and Extension Agenda and Program (NIRDEAP) for Livestock and Poultry.
- Department of Agriculture-Agribusiness and Marketing Assistance Service (DA-AMAS). 2001. Broiler industry situation report. <<http://www.da.gov.ph/agribiz/broiler.html>>
- Department of Agriculture and National Agricultural and Fishery Council (DA & NAFC). 2002a. Broiler Industry Master Plan. Quezon City, Philippines, June 2002.
- \_\_\_\_\_. 2002b. Layer Industry Master Plan. Quezon City, Philippines, June 2002.
- Deaton, A. and J. Muellbauer. 1980. *Economics and Consumer Behavior*. Cambridge University Press: Cambridge.
- De Castro, N., R. Ranola, A. Lambio, H.S. Chang, C. Dagaas, and M. Malabayabas. 2002. "Market Prospects of Duck Eggs and By-products." Paper presented at the 39th Philippine Society of Animal Science (PSAS) Annual Convention, held in Cebu City, Philippines.
- \_\_\_\_\_. "Marketing Practices of Native Chicken Traders and Farmers in Selected Areas in the Philippines." Paper presented at the 40th PSAS Annual Convention, held at Heritage Hotel, Manila, 23-24 October 2003.
- Delgado, C., M. Rosegrant, H. Steinfeld, S. Ehui, and C. Courbois. 1999. "Livestock to 2020 – The Next Food Revolution." Food, Agriculture and Environment Discussion Paper 28. IFPRI/FAO/ILRI.
- Delgado, C., C. Narrod, and M. Tiongco. 2003. Policy, Technical, and Environmental Determinants and Implications of Scaling-up of Livestock Production in Four Fast-growing Developing Countries: A Synthesis. <<http://www.fao.org/wairdocs/LEAD/X6170E/X6170E00.HTM>>
- Devendra, C. 1993. Sustainable Animal Production from Small Farm Systems in South-East Asia. FAO, Rome <<http://www.fao.org/docrep/003/t0757e/T0757E00.htm>>
- Dwinger, R.H., J.G. Bell, and A. Permin. 2001. "A Program to Improve Family Poultry Production in Africa." In R.G. Alders and P.B. Spradbrow (eds). *ACIAR Proceedings No. 103, SADC Planning Workshop on Newcastle Disease Control in Village Chickens*, held in Paptto, Mozambique, 6-9 March 2000. Canberra: ACIAR.
- Eales, J.S. and L.J. Unnevehr. 1993. "Demand for Beef and Chicken Products: Separability and Structural Change". *American Journal of Agricultural Economics*, 70: 521-532.
- Ellendorff, F. 2003. "The Crossroad of Consumer Demand and Reality". *World Poultry*, 19 (3):. 25-24.
- Fabiosa, J.F., H.H. Jensen, and D.Yan. 2004. "Output Supply and Input Demand System of Commercial and Backyard Poultry Producers in Indonesia". Working Paper 04-WP 363. Center for Agricultural and Rural Development, Iowa State University.
- Food and Agriculture Organization (FAO). 2000. *Integrated Backyard Systems*. FAO, Rome. <http://www.fao.org/ag/againfo/subjects/documents/ibsy/default.htm>.
- \_\_\_\_\_. 2004. "FAO Recommendations on the Prevention, Control and Eradication of Highly Pathogenic Avian Influenza in Asia". FAO Position Paper. FAO, Rome. <<http://www.fao.org/eims/upload/165186/FAOrecommendationson/PHAI.pdf>>
- Flake, O.L. and P.M. Patterson..1999. "Health, Food Safety and Meat Demand". Paper contributed to the American Agricultural Economics Association Annual Meeting, held in Nashville, TN, August 1999.
- Fujimura, S., T. Muramoto, M. Katsukawa, T. Hatano, and T. Ishibashi. 1994. "Chemical Analysis and Sensory Evaluation of Free Amino Acids and 5'-Inosinic Acid in Meat of Hinai-dori, Japanese Native Chicken: Comparison with Broilers and Layer Pullets". *Animal Science Technology*, 65(7): 610-618.
- Habito, C.F. 2002. "Annex IV: Impact of International Market Forces, Trade Policies, and Sectoral Liberalization Policies on the Philippine Hogs and Poultry Sector". In *Livestock Industrialization, Trade and Social-Health-Environment Impacts in Developing Countries*. IFPRI-FAO Project. <<http://www.fao.org/wairdocs/LEAD/X6115E/x6115e0e.htm>>

- Gao, X.M. and J.S. Shonkwiler. 1993. Characterizing Taste Change in Model of U.S. Meat Demand: Correcting for Spurious Regression and Measurement Errors". *Review of Agricultural Economics*, 15: 313-324.
- Gonzales, L.A. 1995. "The Impact of GATT-UR on the Philippine Agribusiness Competitiveness: The Case of Poultry and Livestock Products". Final report submitted to the USAID/ASAP Policy Team. DAI, Pasig City, Metro Manila.
- Gueye, E.F, A.Dieng, and S.Dieng. 1997. "Meat Quality of Indigenous and Commercial Chickens in Senegal". In the Proceedings of the INFPD Workshop held in M'Bour, Senegal, 9–13 December 1997.
- Kitalyi, A.J. 1996. "Village Chicken Production Systems in Developing Countries: What Does the Future Hold?" FAO. <<http://www.fao.org/livestock/agap/war/warall/w6437t/w6437t07.htm>>
- \_\_\_\_\_. 1998. "Village Chicken Production Systems in Africa: Household Food Security and Gender Issues". FAO Animal Production and Health Paper no. 142. . <<http://www.fao.org/DOCREP/w8989e/w8989e00.htm>>
- Lambio, A.L., N.L. de Castro, R.F. Rañola, Jr., H.S. Chang, C.T. Dagaas, and M.L. Malabayabas. 2003. "Technical Constraints to Native Chicken Production in Selected Areas in the Philippines". Paper presented at the 40th Scientific Seminar and Annual Convention of the Philippine Society of Animal Science, held at the Heritage Hotel, Manila, 23-24 October 2003.
- Lambio, A.L., R.F. Rañola, Jr., C.T. Dagaas, and T.M. Cabagay. 2004. "Status and Prospect of Native Chicken Production in the Philippines". Paper presented at the Philippine National Convention and Annual Meeting of the International Society for Southeast Asian Agricultural Sciences–Philippines and the First National Agricultural Bioinformatics Convention and Workshop, held at BSWM, Quezon City, 27 October 2004.
- Lambio, A.L. 2005. "The Future Prospects for Smallholder Native Chicken Producers in the Philippines". Elpidio Quirino Professorial Chair Lecture. 24 June 2005. ADSC Lecture Hall, UPLB-CA.
- Landes, M., S. Persand, and J. Dyck. 2004. "India's Poultry Sector: Development and Prospects. ERS, USDA, Agricultural and Trade Report WRS-04-03.
- Livestock Development Council. 2002. "Layer Industry Situation". <[www ldc gov ph/ layers6.html](http://www ldc gov ph/ layers6.html)>
- Mangabat, M.C. 1998. "Effects of Trade Liberalization on Agriculture in the Philippines: Institutional and Structural Aspects". The CGPRT Centre Working Paper Series. CGPRT, Bogor, Indonesia.
- Mateo, J.P. 2001. "Trends and Prospects of the Broiler Industry in the Philippines for the Millennium". Paper presented to the 3rd 2001 PSAS Lecture Series on "The Philippine Poultry Industry in the 21st Century: Threats and Opportunities", National Agriculture and Fishery Council, Diliman, Quezon City, 17 May 2001.
- McMullin, P. 2003. "Food Safety and Other Contemporary Industry Concerns". Paper presented to the 13th Congress of the World Veterinary Poultry Association, held in Denver, USA, July 2003.
- Mendoza, M.S. and M.W. Rosegrant. 1995. "Pricing Behavior in Philippine Corn Markets: Implications for Market Efficiency". Research Report 101. International Food Policy Research Institute, Washington, D.C.
- Minga, U.M., M.M.A. Mtambo, A.M. Katule, S.K. Mutayoba, N.A. Mwalusanya, P. Lawrence, R.H. Mdegela and J.E. Olsen. 2001. In R.G. Alders and P.B. Spradbrow (eds). 2001. ACIAR Proceedings No. 103. SADC Planning Workshop on Newcastle Disease Control in Village Chickens, held in Paptto, Mozambique, 6-9 March 2000. Canberra: ACIAR.
- Mojica-Sevilla, F. 2005. "The Philippine Broiler Industry: Are We at Par or Far?" <[http://atn-riar.agr.ca/asean/4066\\_e/htm](http://atn-riar.agr.ca/asean/4066_e/htm)>
- Pabuayon, I. 1985. "Corn Marketing in the Philippines: An Overview and Review of Trade and Pricing Policies". *Journal of Agricultural Economics and Development*, 15 (January-July): 55-80.
- Piggott, N. and T. Marsh. 2004. "Does Food Safety Information Impact on U.S. Meat Demand?" *American Journal of Agricultural Economics*, 86: 154-174.
- Reardon, T., P. Timmer, and J. Berdegue. 2004. "The Rapid Rise of Supermarkets in Developing Countries: Induced Organizational, Institutional and Technological Change in Agrifood Systems. *Journal of Agricultural and Development Economics*, 1: 168-183. <[Http://www.fao.org/es/esa/eJADE](http://www.fao.org/es/esa/eJADE)>



- Rosegrant, M.W., L.A. Gonzales, B.V. Dimaranan, P.H. Manzo, N.D. Perez, M.S. Mendoza, S. Setboonsarng, and H.E. Bouis. 1992. "The Philippine Corn/Livestock Sector: Performance and Policy Implications". Terminal report submitted to the US Agency for International Food Policy Research Institute.
- Rushton, J., R. Viscarra, E.G. Bieich, and A. McLeod. 2005. "Impact of Avian Influenza Outbreaks in the Poultry Sectors of Five Southeast Asian countries (Cambodia, Indonesia, Lao PDR, Thailand, Viet Nam): Outbreak Costs, Responses and Potential Long-term Control". TCP/PAS/3010. <[http://www.hewsworld.org/downloads/avian\\_flu/docs/pdf/impacts.pdf](http://www.hewsworld.org/downloads/avian_flu/docs/pdf/impacts.pdf)>
- SIKAP/STRIVE Foundation. 2001. "Benchmarking, Global Competitiveness Analysis and Policy Advocacy for the Poultry and Livestock Subsectors". Final Report.
- Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA). 1999. "The Effects of Trade Liberalization on the Philippine Livestock Industry." Final Report.
- Taha, F.A. 2003. "The Poultry Sector in Middle-Income Countries and its Feed Requirements: The Case of Egypt". Outlook Report No. WRS03-02. Economic Research Service, USDA. <<http://www.ers.usda.gov/publications/WRS03/dec03/wrs0302>>
- World Poultry. 2004. "Slow Growth Lifts Chick Meat Quality". World Poultry, 20 (6): 19.