



INTERNATIONAL FOOD  
POLICY RESEARCH INSTITUTE  
*sustainable solutions for ending hunger and poverty*  
Supported by the CGIAR

**IFPRI Discussion Paper 00779**

July 2008

**Contract Farming of Swine in Southeast Asia as a  
Response to Changing Market Demand for  
Quality and Safety in Pork**

**Marites Tiongco, International Food Policy Research Institute  
Maria Angeles Catelo, University of the Philippines, Los Baños  
and  
Ma. Lucila Lapar, International Livestock Research Institute**

Markets, Trade, and Institutions Division

## **INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE**

The International Food Policy Research Institute (IFPRI) was established in 1975. IFPRI is one of 15 agricultural research centers that receive principal funding from governments, private foundations, and international and regional organizations, most of which are members of the Consultative Group on International Agricultural Research (CGIAR).

### **FINANCIAL CONTRIBUTORS AND PARTNERS**

IFPRI's research, capacity strengthening, and communications work is made possible by its financial contributors and partners. IFPRI gratefully acknowledges generous unrestricted funding from Australia, Canada, China, Denmark, Finland, France, Germany, India, Ireland, Italy, Japan, the Netherlands, Norway, the Philippines, Sweden, Switzerland, the United Kingdom, the United States, and the World Bank.

#### **Published by**

### **INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE**

2033 K Street, NW

Washington, DC 20006-1002 USA

Tel.: +1-202-862-5600

Fax: +1-202-467-4439

Email: [ifpri@cgiar.org](mailto:ifpri@cgiar.org)

**[www.ifpri.org](http://www.ifpri.org)**

#### **Notices**

<sup>1</sup> Effective January 2007, the Discussion Paper series within each division and the Director General's Office of IFPRI were merged into one IFPRI-wide Discussion Paper series. The new series begins with number 00689, reflecting the prior publication of 688 discussion papers within the dispersed series. The earlier series are available on IFPRI's website at [www.ifpri.org/pubs/otherpubs.htm#dp](http://www.ifpri.org/pubs/otherpubs.htm#dp).

<sup>2</sup> IFPRI Discussion Papers contain preliminary material and research results. They have not been subject to formal external reviews managed by IFPRI's Publications Review Committee but have been reviewed by at least one internal and/or external reviewer. They are circulated in order to stimulate discussion and critical comment.

Copyright 2008 International Food Policy Research Institute. All rights reserved. Sections of this material may be reproduced for personal and not-for-profit use without the express written permission of but with acknowledgment to IFPRI. To reproduce the material contained herein for profit or commercial use requires express written permission. To obtain permission, contact the Communications Division at [ifpri-copyright@cgiar.org](mailto:ifpri-copyright@cgiar.org).

## Contents

Acknowledgments	v
Abstract	vi
1. Introduction	1
2. Structural Changes in the Pig Sector in the Philippines, Thailand, and Vietnam	3
3. Possible Drivers of Changing Food Consumption Patterns	8
4. Theoretical Perspective	14
5. Challenges to Improving Food Quality and Safety Requirements in the Study Countries	17
6. Existing Policy and Environmental Regulations in the Philippines, Thailand, and Vietnam Related to Improving Food Safety Standards	19
7. Can Smallholders Compete in the Changing Structure of Consumer Demand for Food Safety and Quality in Pork?	23
8. Implications for Policymaking	28
Appendix A: Five Basic Guiding Principles in the Development of Food Safety and Agricultural Health Strategies	30
Appendix B: Selected Policies on Food Safety and Quality Affecting Swine and Poultry Producers in the Philippines	31
References	33

## **List of Tables**

1. Trend in pig production in the Philippines, Thailand, and Vietnam, 1990–2004	4
2. Food consumption in the Philippines	4
3. Net exports in proportion to total domestic pork supply in Southeast Asia, 1990–2003 (%)	5
4. Food consumption in Thailand	6
5. Food consumption in Vietnam	7
6. Income elasticities and food budget shares, 1996	9
7. Market failure and mechanisms of vertical coordination	15
8. Transaction cost factors in sub-Saharan Africa and their probable influence on producer organization	16
9. Top-five pork safety and quality concerns for the key pork export markets	17

## **List of Figures**

1. Pig meat consumption and income in Vietnam, 1990–2005 (constant at 2000)	8
2. GDP at purchasing power parity (PPP) per capita	9
3. Rural and urban population growth rates in the Philippines, Thailand, and Vietnam, 1990–2005	10
4. Potential sources of food safety risks in the pork supply chain (Vietnam case study)	11

## **ACKNOWLEDGMENTS**

The authors wish to express their appreciation to the reviewers for their helpful comments and suggestions, which substantially improved the paper. The authors also thank Achilles Costales of the FAO's Pro Poor Livestock Policy Initiative, Christopher Delgado of the World Bank's Agriculture and Rural Development Department, and Clare Narrad of IFPRI's Markets, Trade, and Institutions Division for their guidance and advice, which improved the discussion on contract farming and food safety. Finally, the authors express their gratitude to Shirley Raymundo and Joy Fabela for formatting the paper.

## **ABSTRACT**

Contract farming is conventionally thought of as a form of industrial organization that helps to overcome high monitoring, supervision, and environmental mitigation costs incurred from ensuring a reliable and uniform-quality supply (from the standpoint of integrators) and high capital and small-scale input and service purchase costs (from the standpoint of individual farmers). But contract farming is also a private sector vertical coordination response to the changing demand for certifying the use of quality inputs to produce quality outputs and of safe production procedures. This paper draws on lessons learned from experiences in the Philippines, Thailand, and Vietnam to illustrate how contract farming accomplishes that goal.

**Keywords: contract farming, changing demand, pork quality and safety**

# 1. INTRODUCTION

The world is experiencing dramatic structural changes in livestock production that are driven primarily by rapid increases in demand for livestock products with accompanying changes in farming and retail structures. In addition to increases in quantities demanded, significant differences are occurring in the nature of the demand for livestock products. As consumers earn beyond a certain income threshold (or migrate to the “middle income” category), their consumption of livestock products tends to increase, their lifestyle changes, and they increasingly demand livestock products with quality, safety, and convenience (e.g., buying food at supermarkets or eating away from home) (Delgado 2005)). As markets become more demanding in terms of information about the quality and safety of livestock products at the time of sale, smallholder producers willing to compete in the marketplace are finding it hard to supply to high-end retailers. Factors contributing to this difficulty are the smallholders’ limited capacity to produce high-quality products at the competitive cost required by these market outlets; lack of access to market information, skills, and technologies; and poor infrastructure barring access to urban markets. All these factors contribute to high and increasing transaction costs (Delgado and Tiongco 2005; Gulati et al. 2005).<sup>1</sup>

Smallholders whose products are not certified as produced and handled through safe processes cannot compete in these markets, even if the products are perfectly safe. To stay involved with the fast-growing segment of the market smallholders must not only meet these standards but also have their products credibly recognized as safe (Delgado et al. 2008). On the other hand, food safety certification involves high cost<sup>2</sup> and requires a price premium to elicit supply for the marketplace. Thus, to meet new production requirements for producing safe livestock products, poor producers must expend additional effort and resources that are not negligible. In Thailand, the quality of pork meant for export is far superior to that consumed domestically. Because the country has low levels of sanitary and safety conditions, increasing exports of Thai pork products will require producers and processors to further control the use of antibiotics and chemical residues and to prevent pigs from being afflicted with foot and mouth disease.

In the Philippines, nationwide adoption of health and hygiene control and quality-related practices, such as Hazard Analysis Critical Control Point (HACCP),<sup>3</sup> Good Agricultural Practices (GAP), and Good Manufacturing Practices (GMP)<sup>4</sup> have not yet materialized. Eventually, these regulations will be fully implemented, and the question is whether smallholders can continue to compete in a market regulated by these new standards of practice and have equal access to crucial information such as biosecurity and biosafety. Although the informal supply chains and the “wet markets” for meat in both rural and urban areas are still the dominant segments, there are no guarantees that traditional consumption patterns and habits will continue to prevail in the long run, particularly with the seemingly overpowering structural changes occurring in modern market chains (Costales et al. 2006). In formal supply chains that are becoming “increasingly quality/safety conscious” and where demand for credence attributes is high

---

<sup>1</sup> Transaction costs are the costs of exchange that arise from asymmetries across market players in access to information and assets (Williamson 1989) and are especially prevalent in the livestock product business.

<sup>2</sup> The Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture estimates the key costs of Hazard Analysis Critical Control Point (HACCP) compliance (includes sanitation, temperature control, planning and training, record keeping and administration, and pathogen-testing costs) for meat-processing plants to be from \$1.1 billion to \$1.3 billion over 20 years (Crutchfield et al. 1997). Jensen and Unnevehr (2000) also estimated the costs and benefits in applying interventions (using the HACCP framework) to control food safety in pork (meat) processing. Their overall estimates of HACCP-compliance costs were higher than the FSIS’s by \$0.01 per carcass for pigs (in the case of steam vacuum intervention).

<sup>3</sup> HACCP is the globally recognized set of procedures and standards for protecting the production, manufacturing, and distribution of food from contaminants and other hazards that are present in the food production processes. These standards are propagated by United Nations agencies, including the Food and Agricultural Organization, the World Health Organization, and the Codex Alimentarius Commission.

<sup>4</sup> GMP compliance is a basic requirement by the Philippine Bureau of Food and Drug before a License to Operate is given to establishments that manufacture processed foods and animal health products. It covers the fundamental principles, procedures, and means needed to design a suitable environment for the production of acceptable quality.

(Poulton et al. 2005), how can smallholders develop some form of quality assurance system for their output and establish trust and reputation? How do smallholders deal with environmental regulations and issues? Will contract farming and vertical integration be the mechanisms smallholder-producers need to meet the new requirements; be recognized as producing safe food; and overcome the high cost of compliance with food safety and quality standards, high capital and small-scale input, and high service purchase costs?

This paper aims to shed light on those research questions. In particular, it examines whether contract farming and vertical integration provide smallholders with a more efficient means to remain competitive in the presence of the changing demand for quality and food safety relative to open markets. Specifically, this paper has the following objectives: (1) identify the driving forces for the growing concern to address pork safety risks in both domestic and export markets; (2) document government responses to the food safety challenges, with a focus on pork; (3) investigate the nature and effectiveness of private responses through contract farming in the pork industry that facilitate smallholders' ability to meet the changing demand for pork quality and safety; and (4) analyze implications for policymaking.

Section 2 of this paper presents a brief description of the significant structural changes that have occurred in the pig industry in the Philippines, Thailand, and Vietnam. Sections 3 through 6 describe the rapid expansion in demand for pork, theoretical perspectives, challenges to improving food quality and safety standards, and the existing policy and environmental regulations in the three study countries. An analysis of smallholders' ability to compete in the changing market is presented in Section 7, which includes case studies from the three countries. The last section of the paper suggests implications for policymaking. This paper takes the perspective of small-scale producers needing to meet the challenges they face in a rapidly changing market environment.



## 2. STRUCTURAL CHANGES IN THE PIG SECTOR IN THE PHILIPPINES, THAILAND, AND VIETNAM

According to data from the Food and Agriculture Organization (FAO), pork is the most widely consumed meat in the world. The estimated world pork consumption is about 100.9 million tons in 2004 and growing at 2 percent annually, predominantly in developing countries. The following discussions provide an overview of the development of the pig sector in the Philippines, Thailand, and Vietnam, three countries in Southeast Asia, which is a major pig-producing region in Asia. Thailand and Vietnam are exporters of live pigs and pork, while the Philippines is a net importer of pork.

### Philippines

The pig sector contributes about 58 percent to the total meat output in the Philippines. In just 10 years, total national pig production grew an estimated 3.6 percent, from about 9 million heads in 1996 to nearly 14 million heads in 2004 (Table 1). In the top-two pig-producing regions in the Philippines (Central Luzon and Southern Luzon), growth in the pig populations in the last decade were 3.6 percent and 5 percent, respectively (Costales et al. 2007). Structural changes in pig production have also occurred. About 77 percent of total pig inventories are still held in “backyard” farms,<sup>5</sup> but the share of pig inventories has been declining (Costales et al., 2007). This trend is evidenced by the substantial increase of commercial pig farms (by 60 percent over 1997–2004; BAS 2005), particularly in Central Luzon and Southern Luzon. A major transformation is also occurring within the commercial pig sector: Large commercial companies are integrating breeding, high-quality internal feed formulation, farrow-to-finish operations, and HACCP-compatible slaughtering and processing of branded products. Growing and finishing operations are done at decentralized sites, either as company-operated farms or through contract production schemes, typically in 400-head modules. The integration of large-scale operations is increasing the capacity of these established firms to respond to the growing demand of institutional markets for certifiable and traceable food-safe meat products in the Philippines.

The estimated consumption of pork per capita in the Philippines rose from 11 kg in 1990 to 18 kg by 2003 (Table 2).<sup>6</sup> In the last decade, meat imports supplemented the growth in domestic demand, but because imports started with a very low base value, its share in total supply continued to remain below 5 percent in 2003 (Costales et al. 2007; FAO 2008). Real average incomes per capita increased at an annual growth rate of 1.3 percent,<sup>7</sup> from \$4,028 in 2000 to \$4,241 in 2004 (World Bank 2006b). With a 3.9 percent increase in purchasing power in 2000–2004, the proportion of expenditures on food consumed at home declined from 44 percent in 1997 to 38 percent in 2003, implying an increase in spending on food consumed outside the home (from 4.7 percent to 5.3 percent during the same period).

---

<sup>5</sup> Backyard farms are defined as farms that hold no more than 20 head of animals in adult equivalent (BAS 2005). This is consistent with a holding of from one to four sows, undertaking farrow-to-wean operations, and selling piglets as output to either the neighboring producers or to village traders. It could also refer to the holding of one or two sows, engaging in farrow-to-finish operations, and selling finished live pigs to itinerant buyers or to meat dealers in the public wet market.

<sup>6</sup> In the FAO Food Balance Sheets, food supply per capita includes net imports.

<sup>7</sup> Vietnam’s growth in real income per capita over the same period (2000–2004) was highest at 5.8 percent, and that of Thailand was 4.3 percent (World Bank 2006b).

**Table 1. Trend in pig production in the Philippines, Thailand, and Vietnam, 1990–2004**

Year	Production ('000 tons, live weight)		
	Philippines	Thailand	Vietnam
1990	684	338	729
1991	702	402	716
1992	658	433	820
1993	731	459	878
1994	765	489	958
1995	805	489	1007
1996	860	511	1052
1997	901	533	1154
1998	933	469	1228
1999	973	454	1318
2000	1008	475	1409
2001	1064	632	1515
2002	1332	646	1654
2003	1385	642	1800
2004	1376	677	2012
<b>Growth rate</b>			
1990–1995	3.3	7.7	6.7
1995–2000	4.6	-0.6	6.9
2000–2004	8.1	9.3	9.3
1990–2004	5.1	5.1	7.5

Source: FAOSTAT database, <http://faostat.fao.org/>, accessed February 2007.

Note: Growth rates were computed using the constant annual growth rate formula:

$$GR = [(end\ value/start\ value)^{(1 / (periods - 1))}] - 1$$

**Table 2. Food consumption in the Philippines**

Food item	Annual consumption (kg per capita)				Annual growth rate,	
	1980	1990	2000	2003	1990–2003	1980–2003
Pork	8.6	11.2	13.6	17.8	3.6%	3.2%
Poultry meat	4.7	4	7.6	8.6	6.1%	2.7%
Milk (excl. butter)	19.8	20.8	22.6	18.7	-0.8%	-0.2%
Beef	2.8	2.3	4.9	3.8	3.9%	1.3%
Fish, seafood	31.8	36.3	29.7	28.8	-1.8%	-0.4%
Rice (milled equiv.)	95.4	99.4	106.4	110.6	0.8%	0.6%
Cereals (excl. beer)	133.7	142.6	140	146.5	0.2%	0.4%
Vegetables	68.4	65.5	61.6	61.7	-0.5%	-0.4%
Fruits	117.4	103.3	98.5	103.5	0.0%	-0.5%

Source: FAOSTAT database, <http://faostat.fao.org/>, accessed February 2008.

Note: Growth rates were computed using the constant annual growth rate formula:  $GR = [(end\ value/start\ value)^{(1 / (periods - 1))}] - 1$ .

This observation further suggests a change among Filipino families from regularly eating at home to eating away from home, which could be linked to the growth of fast-food chains (NSCB 2005).<sup>8</sup> Although fast food is convenient, consumers have less control over the types of food they can choose from and, more importantly, the safety and quality of the food they eat.<sup>9</sup>

The Philippines has been a growing importer of pork and processed pork products over the last 10 years compared with Thailand and Vietnam, which are exporters of pork and have been self-sufficient as well (Table 3). Among the major suppliers of pork to the Philippines are China (60 percent), the United States (8 percent), Germany (7 percent), and France (6 percent).

**Table 3. Net exports in proportion to total domestic pork supply in Southeast Asia, 1990–2003 (%)**

Period	Thailand	Vietnam	Lao People's Democratic Republic	Cambodia	Philippines	Malaysia
1990–1994	0.3	2.1	0	0	-0.1	-2.7
1995–1999	0.8	3.7	0	-0.01	-1.4	-1.9
2000–2003	2.6	2.3	-0.01	-0.02	-2.5	-4.2

Source: FAOSTAT database, <http://faostat.fao.org/>, accessed December 2006.

Note: Net export equals value of exports minus value of imports.

## Thailand

The development of the pig industry in Thailand began with the introduction of new breeds and technological changes in commercial feed and pig housing. Many large-scale commercial farms have adopted evaporated cooling in pig housing, which has had a positive impact on farm size. All these technological changes spurred the 8 percent growth rate in the pig industry over 1990–1995 (see Table 1). However, pig production was hit by the Asian financial crisis and consequently contracted from its peak in 1997; thus, the growth rate in production over 1995–2000 was negative.

The pork industry in Thailand uses modern technology (e.g., a cutting-edge radio frequency identification technology for pig identification and trace-back) and is export oriented. Thailand exports processed pork products mainly to Japan, Hong Kong, and Europe; live pigs to Lao People's Democratic Republic (PDR) and Cambodia; and frozen and chilled meat to Hong Kong. The country's total export in 2005 reached 11.6 thousand tons, valued at 1.5 billion Baht, and was estimated to increase by 24 percent in 2006 because of increasing demand from current importing countries and potential export markets like Singapore, South Korea, and Malaysia (Department of Livestock Development 2006).

Annual domestic consumption of pork in Thailand has increased steadily to 10 kg per capita in 2003 and is expected to increase by 65 percent over the next few years (Table 4).

<sup>8</sup> Fast-food chains, including restaurants, bars, canteens, and other eating and drinking places, have grown by 3 percent over the period 2002–2005.

<sup>9</sup> The contributing risk factors associated with foodborne illnesses caused by food from fast-food chains and retail food establishments are unsafe food sources, inadequate cooking, improper holding temperatures, contaminated equipment, and poor personal hygiene (Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration, 2004).

**Table 4. Food consumption in Thailand**

Food item	Annual consumption (kg per capita)				Annual growth rate	
	1980	1990	2000	2003	1990–2003	1980–2003
Pork	5.8	6.2	7.5	9.8	3.6%	2.3%
Poultry meat	7.1	9.4	13.5	12.0	1.9%	2.3%
Milk (excl. butter)	7.9	15.1	23.6	24.2	3.7%	5.0%
Beef	5.9	5.8	3.6	3.7	-3.4%	-2.0%
Fish, seafood	18.2	20.9	30.6	30.6	3.0%	2.3%
Rice (milled equiv.)	143.5	109.6	106.3	104.4	-0.4%	-1.4%
Cereals (excl. beer)	152.4	121.3	123.6	122.1	0.1%	-1.0%
Vegetables	53.4	38.2	40.3	41.8	0.7%	-1.1%
Fruits	136.9	89.0	92.3	86.4	-0.2%	-2.0%

Source: FAOSTAT database, <http://faostat.fao.org/>, accessed February 2008.

Note: Growth rates were computed using the constant annual growth rate formula:  $GR = [(end\ value/start\ value)^{1/(periods - 1)}] - 1$ .

## Vietnam

The livestock sector of Vietnam accounts for more than 20 percent of agricultural GDP (up to 6 percent of total GDP), of which pork is the most significant contributor (71 percent of total livestock production). Regionally, Vietnam is the second-largest producer of pork (2.3 million tons in 2005) after China (45.2 million tons; FAO 2008). The growth rate of live-weight output of pigs continued to be strong at 7 percent over 1990–1995 and 1995–2000, and 9 percent over 2000–2004 (see Table 1). The main explanation behind this dramatic growth of the pig sector has been use of better-quality feeds; use of more high-yield lean meat hybrids and foreign swine breeding stocks; and investment by the private sector in slaughtering and processing, stimulated largely by strong domestic demand. Much of the increases in production are driven by rising demand for livestock products in Vietnam, particularly in urban areas; from 2000 to 2005 the increase in consumption of livestock products was 7.8 percent per year (Hall et al. 2004). As shown in Table 5, consumption of pork per capita in Vietnam has increased by 6 percent annually since 1990, reaching an average of 22 kg in 2003.

**Table 5. Food consumption in Vietnam**

Food Item	Annual Consumption (kg per capita)				Annual Growth Rate	
	1980	1990	2000	2003	1990–2003	1980–2003
Pork	5.5	10.8	17.1	22.0	5.6%	6.2%
Poultry meat	1.8	2.6	4.7	5.6	6.1%	5.1%
Milk (excl. butter)	1.6	1.4	8.4	9.6	16.0%	8.1%
Beef	1.9	2.5	2.4	2.6	0.3%	1.4%
Fish, seafood	10.5	13.2	19.0	17.5	2.2%	2.2%
Rice (milled equiv.)	133.4	155.0	169.6	169.1	0.7%	1.0%
Cereals (excl. beer)	157.7	165.2	185.8	187.8	1.0%	0.8%
Vegetables	42.0	46.0	74.3	83.5	4.7%	3.0%
Fruits	43.3	43.0	50.2	55.7	2.0%	1.1%

Source: FAOSTAT database, <http://faostat.fao.org/>, accessed February 2008.

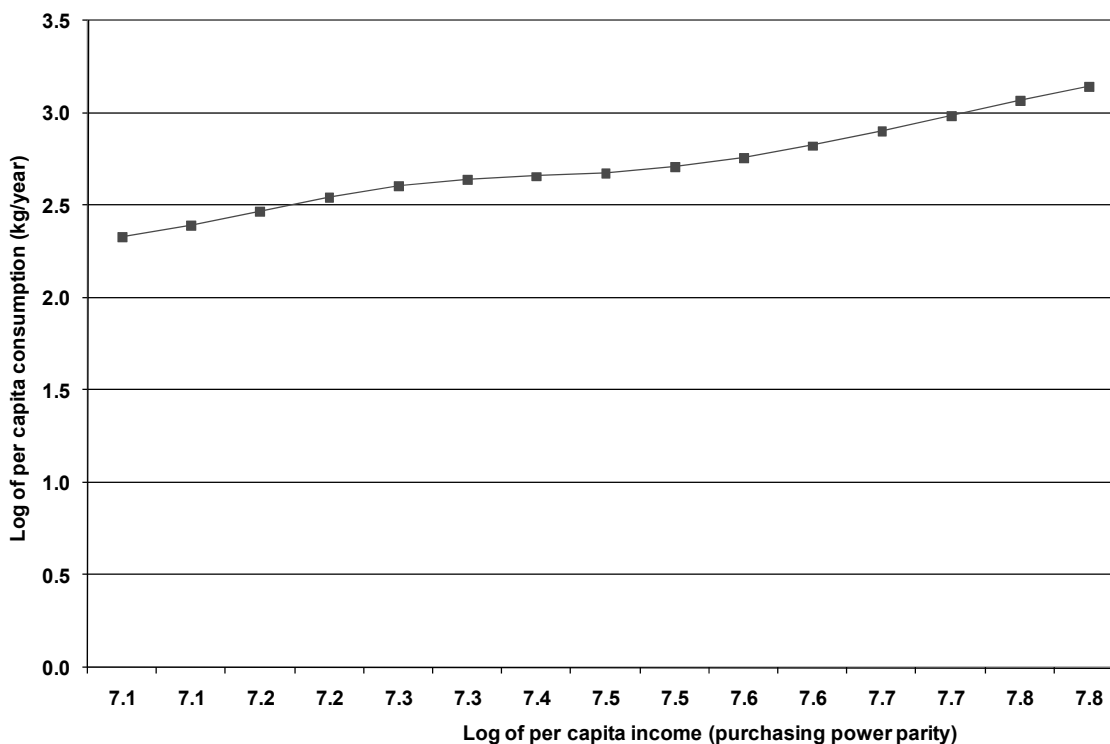
Note: Growth rates were computed using the constant annual growth rate formula:  $GR = [(end\ value/start\ value)^{1 / (periods - 1)}] - 1$ .

This rapid increase in demand for pig meat was induced by an annual 8 percent rise in income between 1990 and 2005 (Figure 1) and dietary changes toward more animal protein (brought about by a 5.4 percent increase in purchasing power each year over the same period).

### 3. POSSIBLE DRIVERS OF CHANGING FOOD CONSUMPTION PATTERNS

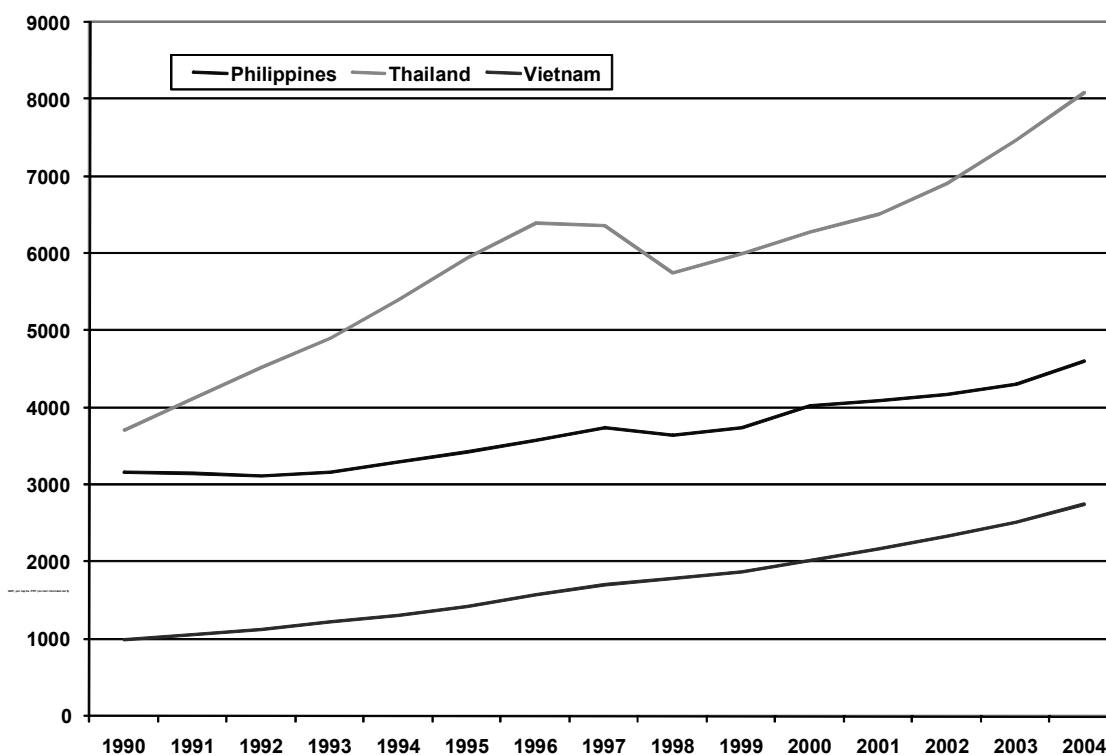
One of the primary factors affecting food consumption patterns is the ability to purchase food (e.g., see Figure 1). The study countries have witnessed major increases in household income levels per capita for the last two decades (Figure 2). Cereals account for a predominant share of the food budget, particularly for consumers in the Philippines and Vietnam, followed by fish and meat (Table 6). In Thailand, most of the typical food budget goes toward beverages and tobacco, followed by meat and almost equal expenditure shares for fruits and vegetables and cereals. The income elasticities of all food items in the study countries are less than one (except for beverages and tobacco in Vietnam), which implies that those food items are necessities. However, cereals are relatively and significantly more income inelastic than meat and dairy products. Thus, although the diets of most Southeast Asian people are still largely cereals based (including rice), it can be inferred that as the purchasing power of consumers increases, a lesser proportion of the increase in income is spent on cereals and a relatively greater proportion is spent on high-value products such as meat (especially pork), dairy, and fruits and vegetables.

**Figure 1. Pig meat consumption and income in Vietnam, 1990–2005 (constant at 2000)**



Sources: Data on per capita income taken from the World Bank (2006b); data on per capita consumption from FAOSTAT database, <http://faostat.fao.org/>, accessed February 2008.

**Figure 2. GDP at purchasing power parity (PPP) per capita**



Source: World Bank (2006b).

**Table 6. Income elasticities and food budget shares, 1996**

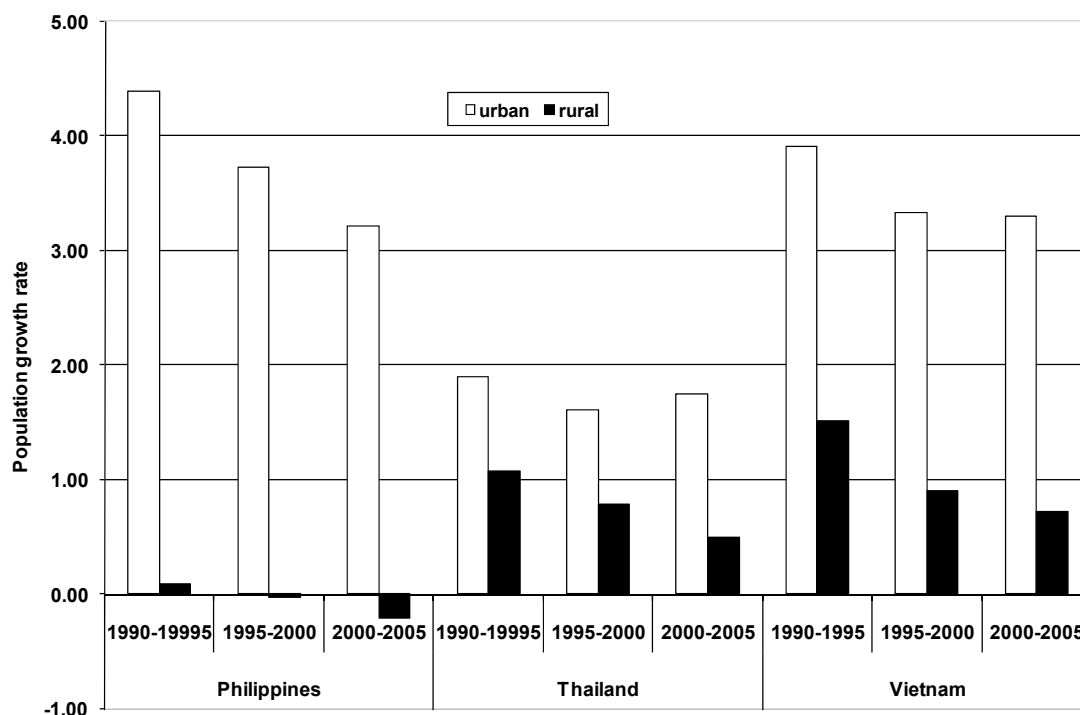
Food Items	Income Elasticity			Food Budget Share		
	Philippines	Thailand	Vietnam	Philippines	Thailand	Vietnam
Beverages and tobacco	0.89	0.92	1.10	11.91	28.57	7.85
Breads and cereals	0.39	0.43	0.51	29.73	16.11	35.65
Dairy	0.75	0.75	0.86	6.71	5.23	2.81
Fats and oils	0.42	0.45	0.53	1.76	2.76	1.51
Fish	0.78	0.79	0.90	14.50	3.31	10.34
Fruits and vegetables	0.56	0.56	0.64	11.10	16.38	9.44
Meat	0.70	0.70	0.78	14.49	18.64	21.93
Other foods	0.70	0.69	0.78	9.81	8.99	10.48

Source: Regmi et al. (2001).

Further, urbanization is increasing in these countries, which is also recognized as another key factor influencing consumption of animal products per capita (Delgado et al. 1999; Figure 3). Additionally, changes in capita are correlated with urbanization, which also affects food consumption patterns (Regmi et al. 2001). Urbanization is accompanied by changes in habitual food consumption patterns and lifestyle changes. In developing countries that are urbanizing, exposure to the “urban” eating pattern increases as income levels increase, resulting in quantitative and qualitative changes in dietary

intake (Pingali 2004). In addition to having access to a wider range of food choices in the urban centers, urban consumers increasingly develop a preference for convenience and taste (Delgado et al. 1999). In developed countries, demand for “quality attributes” has escalated in recent years, with media attention and public awareness raised by various incidences of foodborne illnesses. This demand has percolated into developing countries, where consumers are becoming increasingly aware of the consequences of eating contaminated food products. These trends offer considerable opportunities for efficient and vertically coordinated farmers, but some threats are also present, especially for poor small-scale and unorganized farmers.

**Figure 3. Rural and urban population growth rates in the Philippines, Thailand, and Vietnam, 1990–2005**



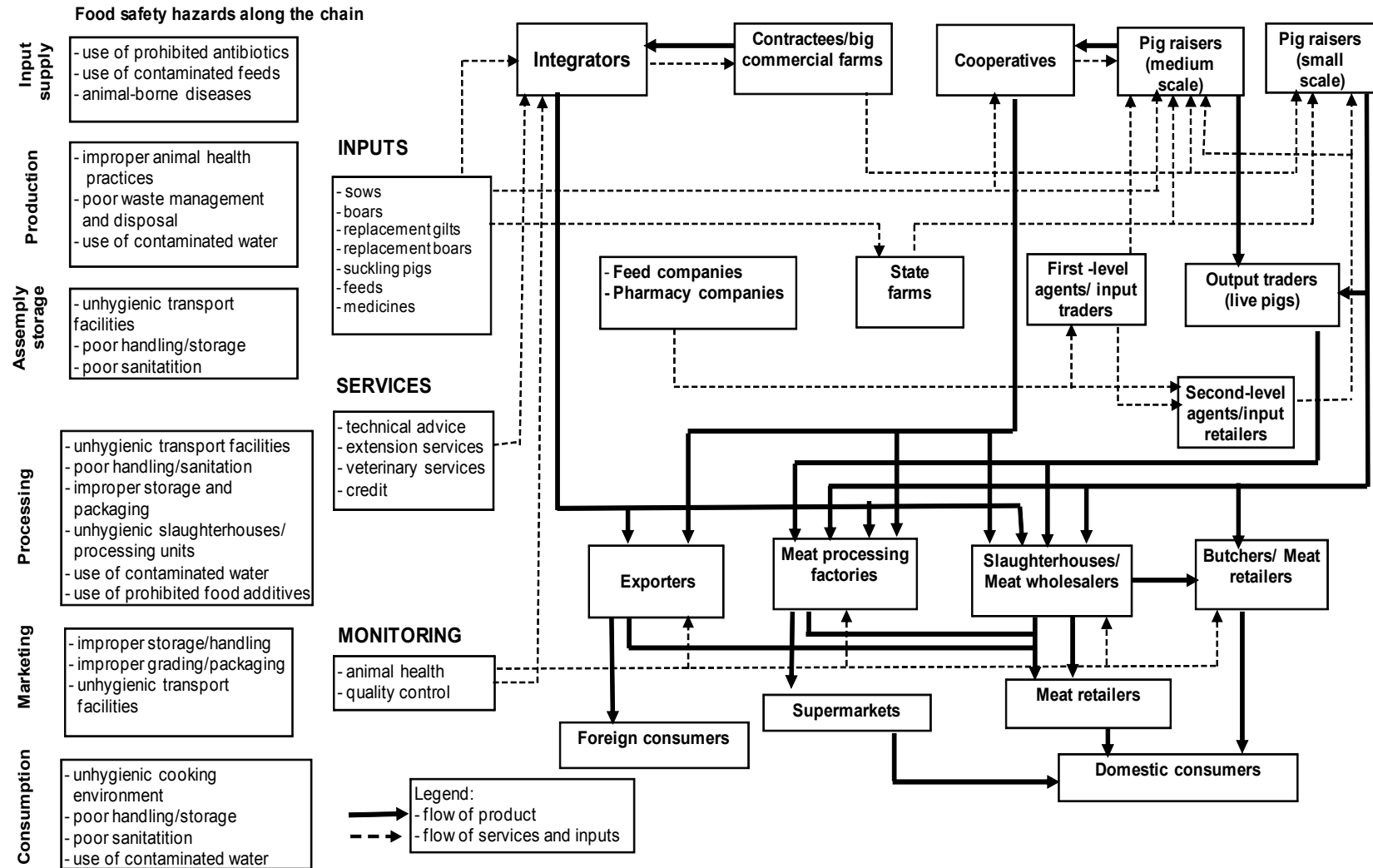
Source: FAOSTAT database, <http://faostat.fao.org/>, accessed April 2008.

In the case of pork, safety concerns are growing because pork is a potential source of several economically important microbial pathogens, including *Clostridium perfringens*, *Staphylococcus aureus*, *Listeria monocytogenes*, *Campylobacter jejuni*, and *Salmonella* (Jensen and Unnevehr 2000). These biological hazards can occur at any point along the pork supply chain, from production through processing, and finally at the consumer end, particularly for consumers who prefer to buy freshly slaughtered meat from traditional wet markets (Figure 4). For example, *Salmonella* can enter at any stage of the supply chain.<sup>10</sup> It can be introduced and spread at the farm level through contaminated feed and water or through contact with other pigs, rodents, or people working with pigs. *Salmonella* can also be spread during transport, in compartments where pigs rest before slaughter and during slaughter.

<sup>10</sup> The supply chain for the pig industry starts with the procurement of feed ingredients from domestic or imported sources. Next, feed-milling activities are integrated with the operations of medium and large commercial farms. The final links in the chain are the processing plants (slaughterhouses) and then the wholesale and retail distribution channels.



Figure 4. Potential sources of food safety risks in the pork supply chain (Vietnam case study)



Source: Based on Umali-Deininger and Sur (2006) and ILRI et al. (2007).

The public is becoming more aware of the health risks of consuming unsafe food as well as the environmental and animal welfare implications of production processes (Buzby 2003; Figuié et al 2004). Structural changes toward more industrialized livestock production systems are also associated with the phenomenal growth of modern supermarkets in developing countries in the last decade.<sup>11</sup> By the mid-2000s, the agrifood retail share of these large “one-stop shops” or convenience stores is predicted to rise to between 10 percent and 20 percent in China, India, and Russia, as well as in some countries in Central and South America, Southeast Asia, and Africa. These latter countries belong to the “third wave” of supermarket diffusion (Reardon and Timmer 2005). Because supermarkets enforce their own standards, the expansion of their market share could represent a growing demand for supermarket-mediated products, including meat. The experiences in developing countries such as the Philippines, Thailand, and Vietnam point to a strong correlation between rising urbanization, increasing incomes per capita, and growing demand for convenience and differentiated products.

In the Philippines, prices (per kg) of branded pork cuts sold in supermarkets reveal price premiums of at least 8–10 percent over prices of similar cuts in terminal wet or open markets (discussions with key informants and major suppliers of pork in one of the supermarket chains in the Philippines).<sup>12</sup> Further, supermarkets now offer a richer variety of pork cuts sold freshly chilled or frozen. The price premium, therefore, could indicate how much consumers are willing to pay for combined perceptions of quality and food safety, variety, and convenience and packaging. The question is whether smallholders can produce the output needed to penetrate supermarkets and thus take advantage of this price differential.

In general, supermarkets in the Philippines procure pig carcasses from slaughterhouses with at least class AA facilities.<sup>13</sup> The wet market is a terminal market where smallholder producers, particularly in rural areas, are mediated by informal market chains (traders); where their products end up depends on which type of slaughterhouse facilities they go through. Thus, if a smallholder’s output can be admitted to a class AA slaughterhouse through the mediation of a village trader, that farmer has some hope of supplying supermarkets. However, studies have shown that the “procurement systems of large retailers and supermarkets in developing countries involve purchase consolidation, a preference for specialized wholesalers and stringent private quality and safety standards” (Weatherspoon and Reardon 2003; see also Reardon et al. 2003).

Thus, for smallholders to become participants in the supply chains for supermarkets and higher-end market outlets, they must be able to produce a steady volume of high-quality pork and tailor the pork products to meet consumer demand. Unfortunately, facilities for producing and processing meat of certifiable quality and safety are not readily accessible to smallholders, who typically cater only to their neighbors, local market vendors, local processors, and village traders. The lack of specific requirements for hygienic transport and slaughtering facilities and for proper handling, packaging, and storage, in addition to the lack of stringent meat inspections by veterinary authorities, mean that consumers in wet markets could face a potentially high risk of foodborne illness from microorganisms (e.g., *Salmonella*, *Campylobacter*, and *Escherichia coli*), dirt, and other pork contaminants. But so far, at least in the Philippines, no recorded data show that meat coming from non-accredited establishments is creating risk to public health (Catelo 2002), although that may be a function of underreporting. The lack of documentation and absence of reliable data in many countries make it difficult to categorically suggest that ingesting contaminated and improperly handled meat caused foodborne illnesses. What has been recorded so far are incidences of notable foodborne diseases—namely, cholera, typhoid, food poisoning, hepatitis A, dysentery, and diarrhea. For example, in Thailand, reports from the Bureau of Epidemiology indicates that in 2004 there were 146,325 cases of acute diarrhea; 2,421 cases of dysentery; 17,128 cases of food poisoning; and 797 cases of enteric fever (four deaths). Likewise, in Vietnam, reports on foodborne disease outbreaks point to an estimated 1.5 cases of diarrhea per person annually, but the

---

<sup>11</sup> Digal and Concepcion (2004) note that supermarket outlets had an annual growth rate of 30 percent over the period 1994–2001. In Thailand, supermarket outlets grew 11 percent between 2001 and 2002 (USDA 2002).

<sup>12</sup> A study by the Vietnam Agriculture Science Institute (VASI) shows that about 86 percent of consumers in urban areas are willing to buy high-quality meat even at higher prices and to pay a premium of 16 percent above current prices for receiving safe products (Lapar et al. 2003).

<sup>13</sup> Meat labeled class AA can be traded domestically. A more detailed explanation of meat classifications is presented in the Section 6.

sources of the infections are unknown (World Bank 2006a). However, there is agreement that the number of microorganisms of animal origin has become widespread and a growing public health problem in the last 20 years (WHO 2002).

## 4. THEORETICAL PERSPECTIVE

Various schools of thought regarding firm behavior, property rights, and agency behavior form the theoretical underpinnings of the phenomenon of contract farming. But the more dominant theoretical framework is transaction cost economics (TCE), which evolved from the seminal works of Coase (1937) and Williamson (1979, 1985, 1989). TCE has been expounded on by the proponents of the New Institutional Economics (NIE) school, which recognizes the vital role of the social and legal norms and rules underlying economic activities. TCE asserts that economic agents are rationally bounded and tend to be opportunistic. These conditions give way to market transactions that involve risks and perils, the mitigation of which would entail transaction costs. The degree of transaction costs depends on the transaction characteristics of uncertainty, asset specificity, and frequency of exchange. When these transaction characteristics entail costs that are prohibitive to engage in direct market exchange (i.e., spot markets), the firm will find it more efficient to vertically integrate—that is, to undertake the production of the good that it needs for its own economic activity. In between the extremes of spot markets and vertical integration are “hybrids” of transaction organization options, such as contract farming. The firm will then choose the organization that minimizes transaction costs. Although the TCE approach to explaining contracts is not without criticism, it remains the dominant approach used in the literature in investigating the contract-farming phenomenon (Catelo and Costales, forthcoming).<sup>14</sup>

The NIE framework has been applied by numerous authors (e.g., Minot 1986; Delgado 1999; Key and Runsten 1999) to explain the theoretical rationale for the existence of contract farming. As an illustration of the framework, Table 7 demonstrates that consumers have particular preferences with respect to each characteristic of agricultural produce—perishability, quality, and production variability in terms of quantity and quality—and are prepared to pay a premium for the produce having the desired attributes. When asymmetric information exists between the buyer and the seller regarding the quality of the product, product markets might break down entirely, presenting a need for coordination through contracting. When no information exists on the production technology needed for efficient production and optimum quality and on the desired characteristics of the product, producers find it hard to adjust to the changing demands of consumers, thus making it necessary for some form of vertical coordination or integration. Measuring difficulties associated with overcoming asymmetric information about product quality may also be viewed as an “exchange hazard” (Williamson 2000; Poppo and Zenger 2002). When pig quality attributes are difficult to measure, producers might engage in opportunistic behavior to exploit private information by failing to perform as agreed, such as shirking or cutting corners on quality, also referred to as “moral hazard.” This is expected to lead to contracts with added security features to mitigate the hazard, such as provisions for third-party monitoring of sellers, documents to justify activities performed, and other means of increasing information disclosure.

As shown in the bottom section of Table 7, the failures of major agricultural factors—markets, land, credit, inputs, and services—limit the adoption of new crops and restrict smallholders’ access to the inputs, technology, and information they need to produce timely and good-quality products.

Delgado (1999) confirmed the points made by Minot (1986) by applying the same NIE framework to review the specific factors in rural Africa most likely associated with transaction costs and how those factors shape the type of producer organization most suited to dealing with them. As summarized in Table 8, each commodity has both production and marketing characteristics that determine the optimal form of production organization for that commodity. Labor intensiveness favors smallholder organization, whereas both economies of scale and heavy investment requirements in production have the opposite effect. High-quality specificity, as in dairy products, tends to discourage both independent smallholders and large-scale vertical integration. Contract farming reduces the need for labor supervision while increasing producers’ access to needed inputs and skills. High perishability also tends to discourage independent small-scale operators because of the high risks involved in not having an assured processor market.

---

<sup>14</sup> For detailed reviews of the hierarchy of transaction organizations, see Williamson (1979) and Peterson and Wysocki (1997). For criticisms and alternative viewpoints to TCE, see Baumann (2000), Rehber (2000), Hobbs and Young (2001), and Da Silva (2005).

**Table 7. Market failure and mechanisms of vertical coordination**

Type of market failure and resulting coordination problems	Circumstances under which failure occurs	Method by which institutions improve coordination	
		Contracting	Vertical integration
Production information asymmetry: Buyer knows significantly more than growers about the production technology	Agricultural crop has complex technology or is new to grower		
Quality improvements could increase profitability for growers, but growers lack technical knowledge	Quality varies, affects demand, is controllable	Management-providing contract that specifies practices to achieve quality and timing at least-cost production; cost of extension covered in marketing good	Transfer of production information within firm through training and supervision
Better timing of supply could raise profitability, but growers cannot change timing	Timing of supply affects demand, is controllable		
Improved practices would be profitable, but growers are not familiar with them	Improved practices exist and are known by buyer		
Marketing information asymmetry: Buyer knows significantly more about markets than growers (e.g., future, seasonal patterns, quality needs)	Agricultural crop has specialized or distant market, demand is relatively new		
Quality improvements could increase profitability for growers, but growers are not aware of premium on quality	Complex quality requirements, especially exports	Market specification contract that allows greater exchange of information regarding demand: Quality timing and price	Market information transferred within the integrated firm down to the field level
Better timing of supply could raise profitability, but growers are not aware of timing requirements	Perishable good for processing or export		
Greater production is profitable, but growers are not sure of future price	Volatile or new market, grower does not trust monopsonist		
Imperfections in markets for credit, inputs, and agricultural services: High transaction costs, growers unsure of profitability of inputs and services, lenders unsure of reliability of borrowers, policy-induced distortions that reduce input and credit availability	Use of large amounts of inputs, particularly specialized inputs, is profitable for the commodity		
Quality is suboptimal because of limited use of inputs and services	Agricultural crop for which quality depends on inputs	Resource-providing contract supplying inputs and credit; repayment assured by contract to market product	Credit and inputs provided internally within the firm
Timing of supply is inappropriate or uncoordinated without inputs and services	Agricultural crop for which timing depends on inputs		
Suboptimal output and excessive use of inputs and services	Agricultural crop for which input use reduces production costs		

Source: Minot (1986).

A high value-weight ratio tends to be associated with greater risks in marketing and a more specialized clientele, leading to contractual or vertically integrated forms of organization. Similarly, the absence of domestic markets for export items makes it risky to produce outside a marketing structure that can handle these items. Finally, items that are exported to Europe, such as cut flowers and vegetables, tend to be characterized by economies of scale in marketing, as are other perishables that require a cold chain for handling. Such economies of scale tend to lock out independent small operators (Delgado 1999).

**Table 8. Transaction cost factors in sub-Saharan Africa and their probable influence on producer organization**

Transaction cost factors (their presence suggests that these costs are high, <i>ceteris paribus</i> )	Presence of the factors at left is likely to favor the form of organization indicated		
	Independent small operators	Contract institutions between small operators and processors/marketers	Vertically integrated, more specialized large farms or plantations
Commodity characteristics in production:			
High labor intensiveness	Yes	Yes	No
Economies of scale in production	No	No	Yes
High returns to extension/farm/research linkages	No	Yes	Yes
Complex purchased input use required	No	Yes	Yes
High investment requirements	No	No	Yes
Commodity characteristics in processing/marketing:			
Quality specificity	No	Yes	No
Perishability/need for coordination with processor	No	Yes	Yes
High value to weight	No	Yes	Yes
Principal market is export	No	Yes	Yes
High economies of scale in marketing	No	Yes	Yes

Source: Delgado (1999).

## 5. CHALLENGES TO IMPROVING FOOD QUALITY AND SAFETY REQUIREMENTS IN THE STUDY COUNTRIES

Concerns about food safety<sup>15</sup> have been increasing worldwide because of periodic outbreaks of foodborne illnesses, new scientific links between animal and human diseases, discoveries of chemical residues and contaminants in food, and even dietary concerns (Unnevehr 2003). These concerns are being induced by requirements related to the globalization of trade of agricultural products and by changing perceptions of consumers regarding food safety. Food quality on the other hand, is also an important issue that cannot be alienated from food safety. Food quality can be considered as a complex characteristic of food (such as nutritional value, color, texture, taste, including safety) that determines its value or acceptability to consumers (FAO 1999).

Concerns over food safety and quality vary by commodity. In the case of pork, major safety concerns include pathogens, toxins, foot and mouth disease, and antibiotics, and major quality concerns include leanness, freshness, color, consistency in size of cuts, and packaging (Table 9).

**Table 9. Top-five pork safety and quality concerns for the key pork export markets**

Country	Top-five pork safety concerns	Top-five pork quality concerns
China, Hong Kong	<ul style="list-style-type: none"> <li>• Pathogens</li> <li>• Residues</li> <li>• Foot and mouth disease (FMD)</li> <li>• Trichina</li> <li>• Freshness</li> </ul>	<ul style="list-style-type: none"> <li>• Freshness (consumer)</li> <li>• Low external fat, good trim (traders and consumers)</li> <li>• Meat color</li> <li>• Proper specification</li> <li>• Packaging type and weight</li> </ul>
Japan	<ul style="list-style-type: none"> <li>• Pesticide/antibiotic residues</li> <li>• Genetically modified food for feed</li> <li>• <i>E. coli</i> O157</li> <li>• Foreign objects/needles</li> <li>• Dioxin</li> </ul>	<ul style="list-style-type: none"> <li>• Pale, soft, and exudative pork (PSE)</li> <li>• Consistency in cutting specification</li> <li>• Consistency of sizing</li> <li>• Meat color</li> <li>• Fat color</li> </ul>
Taiwan	<ul style="list-style-type: none"> <li>• Foreign materials</li> <li>• FMD</li> </ul>	<ul style="list-style-type: none"> <li>• Control of fat content</li> <li>• Packaging (polyline carton)</li> </ul>
Europe	<ul style="list-style-type: none"> <li>• Bacterial infection (<i>Salmonella</i>, etc.), food poisoning</li> <li>• Dioxin</li> <li>• Antibiotics, growth promoters</li> <li>• Trichinosis</li> <li>• BSE (meat and bonemeal), poisoned feed</li> </ul>	<ul style="list-style-type: none"> <li>• Different specifications between countries</li> <li>• Trim</li> <li>• PSE</li> <li>• Fat cover</li> <li>• Delivery times (misunderstanding about quality of frozen product)</li> </ul>

<sup>15</sup> "Food safety" implies absence or acceptable and safe levels of contaminants, adulterants, naturally occurring toxins or any other substance that may make food injurious to health on an acute or chronic basis (FAO 1999).

**Table 9. Continued**

<b>Country</b>	<b>Top-five pork safety concerns</b>	<b>Top-five pork quality concerns</b>
Russia	<ul style="list-style-type: none"><li>• Dioxin</li><li>• Food poisoning (chemical)</li><li>• Trichinosis</li><li>• Food poisoning/bacterial contamination</li><li>• Adulterated product</li></ul>	<ul style="list-style-type: none"><li>• Different specifications between countries</li><li>• Wizard trim</li><li>• Delivery times (misunderstanding about quality of frozen product)</li><li>• PSE</li><li>• Fat cover</li></ul>
Caribbean	<ul style="list-style-type: none"><li>• No major issues</li></ul>	<ul style="list-style-type: none"><li>• Leanness</li><li>• Size</li><li>• Inconsistent packaging, presentation</li></ul>

Source: Du (2000).

As a response to food safety and quality concerns, internationally mandated organizations such as the United Nations' Codex Alimentarius Commission (Codex) and trade blocks like the European Union (EU) have embarked on an integrated approach to ensure a high level of food safety and quality from farm to table, covering all sectors of the food chain. These standards continue to evolve as new risks become known, and compliance with the standards has become and remains a serious challenge for producers and regulatory agencies, particularly in exporting countries.



## **6. EXISTING POLICY AND ENVIRONMENTAL REGULATIONS IN THE PHILIPPINES, THAILAND, AND VIETNAM RELATED TO IMPROVING FOOD SAFETY STANDARDS**

The following discussion illustrates governmental responses to food safety challenges that reflect the basic principles discussed in Appendix A. Numerous government agencies are involved in the implementation of food safety measures of specific commodities. For example, in Thailand, three agencies are involved in the development of food laws and regulations: (1) the Food and Drug Administration of the Ministry of Public Health; (2) the Office of Agricultural Commodities and Food Standards of the Ministry of Agriculture and Cooperative, and (3) the Thai Industrial Standards Institute of the Ministry of Industry. The first two agencies are also involved in the implementation of food safety systems, certification, and information dissemination.

### **Philippines**

In the Philippines, the National Meat Inspection Services (NMIS) is a food regulatory agency tasked with standard setting; monitoring meat quality and safety; and issuing accreditation of meat establishments such as slaughterhouses, poultry dressing plants, meat processing plants, and cold storage facilities. Live pigs are brought to slaughterhouses where meat quality standards are implemented, and carcasses certified by the NMIS are eventually sold through wholesale and retail distribution channels. Slaughterhouses, poultry-dressing plants, meat-processing plants, and cold storage facilities must meet certain animal health and food safety standards and sanitary regulations before they get accredited. NMIS classifies the traded meat in these establishments as A, AA, or AAA. Class AAA meat is of exportable quality, class AA meat is of domestic trade quality but not for export, and class A meat is for local municipal trade only. Outputs from smallholder operations that undergo processing at slaughterhouses and dressing plants are classified as either class A or class AA (Catelo 2002).

In 2002, the Philippine Department of Agriculture sent out Memorandum Order No. 7 mandating an HACCP audit of all meat and milk plants exporting products to the Philippines to ensure that the food products are safe. By 2003, the HACCP program became mandatory to all accredited meat plants, whether involved in domestic distribution or export. Appendix B summarizes the key regulations governing the safety of domestically produced food products, which the government enacted in response to the changing structure of consumer demand for quality and food safety.

The primary issues related to food safety in Philippine swine production are the misuse of antibiotics that leave residues in meat, the negative externalities of using genetically modified feed ingredients, and handling and cold chain management to preserve meat quality (Catelo 2002). The Philippines has not yet come up with its own microbiological standards but adopts those of developed countries and international agencies (such as the Codex). In the case of environmental regulations, environmental laws on pollution in the Philippines originally targeted the heavy and light manufacturing and assembly industries. These standards were initially applied only to commercial pig farms with inventories exceeding 1,000 animals (Catelo 2002). However, because nearly 80 percent of pig inventories come from smallholders, and because backyard production in the major producing towns, provinces, and regions is also densely configured, the issue of pollution from these operations has been raised. The rationale is that these farms likely create as much pollution per animal as commercial farms, and they are now concentrated in commercial densities in peri-urban areas. Thus, the Laguna Lake Development Authority (LLDA) imposed a “soft approach” regulation for backyard pig producers that mandate them to install waste treatment facilities or adopt wastewater minimization strategies. This is stipulated in the LLDA Board Resolution 169 Series of 2001. However, this applies only to farms that are within the Laguna de Bay Region (in Southern Luzon) and not nationwide.

In 2006, Implementing Rules and Regulations for the Promotion and Development of Organic Agriculture in the Philippines (Executive Order 481) were put in place (Department of Agriculture 2006).

Relatively stringent organic agriculture standards, patterned after those of the International Federation of Organic Agriculture Movements (IFOAM), have been set for six areas, including livestock, processing, and labelling and consumer information. Certification of organic procedures and products has to be secured from the Department of Agriculture's National Organic Agriculture Program, and smallholders could have difficulty adhering to the conditions and standards.

## Thailand

The pig industry in Thailand is beset by FMD and a substandard supply chain of production, from animal feed to farm production, slaughterhouses, transportation, and wholesale and retail businesses. There is no foreign pressure on swine producers to produce safe meat because fresh pork is not traded in the export market (Poapongsakorn et al. 2003). Mainly processed pork products (ready-to-eat meals) are exported to Japan and Europe.<sup>16</sup> FMD outbreaks continue to emerge sporadically in the country, and because the World Organization for Animal Health has not recognized swine-producing regions as FMD free, Thailand has not been able to export chilled or frozen pork (except to Hong Kong). In addition, the European Commission has not yet approved the veterinarian conditions in the Thai pig farms; hence, export of fresh pork to the EU is not permitted. However, although foreign pressure is absent, the domestic pressure from supermarket chains may be significant, because the domestic market is more important for producers. The private standards of supermarkets may approximate international standards. For exporters of pork, even if fresh pork undergoes processing, there is still significant pressure to meet international standards on raw material (meat).

Indirectly, foreign pressure can also be significant when compliance with World Trade Organization (WTO) agreements results in competition with imported pork.<sup>17</sup> If consumers (buying from supermarkets) have the purchasing power to choose between food-safe imports and domestically produced meat, then domestic suppliers must provide products that match the superior quality of imports.<sup>18</sup>

The standards of food safety that supermarkets impose producers are mostly applied to meat procured from modern slaughterhouses. Because Thailand has few modern slaughterhouses, food safety standards can only be applied to some large-scale farms. Nine slaughterhouses for pigs have been certified for export by the Department of Livestock Development (DLD),<sup>19</sup> including a DLD-owned slaughterhouse rented to Charoen Pokphand Company (CP) via an auction.<sup>20</sup> The DLD inspects slaughterhouses and meat-processing plants and issues GMP/HACCP certification to these facilities if they meet the necessary safety and sanitary requirements.

These slaughterhouses are the major suppliers of pork for supermarkets, large discount stores (large retail outlets), and the food processors producing sausage, ham, and other pork products.<sup>21</sup> Almost all (99 percent) of the pigs from smallholder farms (those with no more than 50 pigs) are slaughtered in small abattoirs owned by municipalities using manual slaughtering procedures. Although the slaughtering activities are subject to veterinarian checks, the hygiene is poorer than that in the modern abattoirs.

---

<sup>16</sup> Thailand's pork exports were projected to grow by 9 percent to 12,000 tons in 2007 because of the rising demand in Japan. The president of the Swine Producers and Processors for Exporting Association, Boonpeng Santiwattanatham, said that Japan was the main export market, with volume jumping by 23 percent to 2,033 tons in the first quarter. However, exports to Hong Kong dropped by 7 percent because its government launched health restrictions. The association plans to find new markets in Singapore, South Korea, and Europe (*Nation* 2007).

<sup>17</sup> In 2002, the WTO agreements allowed imports of pork into Thailand with a 30 percent tariff rate, which means that the industry no longer enjoys the protection of an import ban.

<sup>18</sup> One way to do this is to control the level of antibiotics and chemical residues and eradicate FMD.

<sup>19</sup> The DLD is responsible for the inspection and certification of quality and safety standards for livestock products, animal feeds, veterinary drugs, and biological products.

<sup>20</sup> CP is the largest player in Thailand's pork industry and is fully integrated. It is engaged in feed milling, production, processing, and distribution of a wide variety of products made from chickens, eggs, ducks, pigs.

<sup>21</sup> These groups of large buyers (retailers and processors) have begun to impose food safety standards on the pork they buy. Only large companies can distribute pork and pork products to both domestic and export markets.

Thailand still has a two-tiered market consisting of high-quality products designated mainly for the foreign market and products with widely varied levels of quality for the domestic market. In fact, a substantial number of illegal and uncertified slaughterhouses still have butchers operating on bare ground (at very low costs), which results in a higher risk of contamination from microorganisms, dirt, and other disease-causing infiltrates (Poapongsakorn et al. 2003).

Most small- and medium-scale farms still use excessive drugs, such as antibiotics and growth hormones, to produce the lean, red-meat pigs demanded by consumers. Although contract farmers, most of whom are smallholders (those with no more than 100 pigs per farm), have contracts to sell pigs to large-scale integrators that are the major suppliers of pork in modern supermarkets, no evidence confirms that these small contract farms produce safe meat. Thailand is trying to improve the monitoring of antibiotic overuse and, to a lesser extent, the use of dead animals in some processed food products. Measures to improve food safety in the slaughtering process are likewise being undertaken. However, until recently, the authorities' approach to food safety and enforcement has been voluntary, and because backyard livestock producers often do not strictly follow recommended procedures, enforcement in a small-farm setting is difficult (Poapongsakorn et al. 2003).

When the WTO agreements in 2002 allowed imports of pig meat into Thailand (with a tariff rate of 30 percent), the threat of superior-quality imports led to an increased awareness among both the private and public sectors of the need to enhance production quality. To ensure that livestock were raised to meet the requirements of foreign importers, in 1999 the DLD enacted a regulation establishing a standard for swine, poultry, and cattle farms. The farm standard, which is based on the GAP, is intended to improve the quality and safety of livestock products produced in Thailand. The products from standard farms are certified by the DLD to ensure that they are clean and safe when they reach consumers.

For swine farms whose products are consumed domestically, the farm standard regulations have had no direct impact on practices (Delgado et al. 2003). However, since 2005 all livestock farms have been required to conform to the standard, which includes observing proper pharmaceutical withdrawal times, using environmentally friendly waste management techniques, and adhering to national and regional disease-monitoring measurement.

Farms certified as export farms need to meet the DLD standards and requirements, which it claims are comparable to the standards required by importing countries, including the EU and Japan (Delgado et al. 2003).

As environmental regulations in Thailand, the National Environmental Quality Act (NEQA) was first enacted in 1969 as a comprehensive package for the institutionalization of environmental policy and planning. The NEQA was amended in 1992 as the Enhancement and Conservation of National Environmental Quality Act. Following the amended act, in 1996 the Thai cabinet resolved to adopt the Policy and Plan for National Environmental Quality Preservation and Promotion (1997–2016), or PEQP. Under the PEQP, the line ministries and every province must come up with their own respective action plans. The PEQP produces yet another action plan called the Environmental Quality Management Action Plan (EQMAP), in which water pollution is the priority. Specifically, the EQMAP set water quality standards for two periods, 2001 and 2006, for the Chao Phraya River and the Tha Chin River. Regulations were announced in February 2001 governing waste dumping into watercourses, including effluent standards for pig farms. The new standards became effective on February 24, 2002. Thus far, standards are being monitored and enforced only on medium- and large-scale farms (Poapongsakorn et al. 2003).

## **Vietnam**

In recent years, the Vietnamese government has paid considerable attention to reducing food safety risks in response to the shift in demand for pork with high lean meat ratios in the rapidly urbanizing areas of the country. The most significant act was the creation of the Food Administration within the Ministry of Health in 1999. Established to advise the Ministry of Health on the management of food quality, hygiene, and safety, the Food Administration is responsible for drafting food standards and coordinating safety regulations; conducting information, education, and communication activities in food safety for

stakeholders at all stages of the food chain; testing food products; inspecting and licensing joint venture enterprises; investigating food poisoning outbreaks; and working with Provincial Preventive Health Centers and District Preventive Medicine Teams in establishing pilot foodborne disease surveillance systems in selected provinces in Vietnam to achieve food safety goals (Kim 2002).

The first food safety law was enacted in November 2003 to protect and develop people's health; provide safe food of good quality; and control the production, import, and export of food. It requires that food producers and providers take full responsibility for their products, and entitles customers to inquire about information on the cleanliness issues of food and other safety and to choose and consume safe products. Fertilizers, processed animal feed, pesticides, preservatives, growth hormones, and other farming products must be used according to governmental regulations. Importers and exporters of food products are fully responsible for the safety and quality of their goods. "High-risk" foodstuffs must be state certified as produced under specific conditions. The law also regulates standard setting and the advertising and labelling of foodstuffs. Foodstuffs may not be imported into Vietnam if the remaining period of use is less than 66.6 percent of the period of use stamped on the label (World Bank 2006a). Unprocessed foodstuffs derived from animals and vegetables must be granted a certificate of quarantine by competent state agencies. All materials and chemicals used in processing foodstuffs, the packaging directly touching foodstuffs, imported additives for food, and imported foodstuffs must be inspected.

Concerns about inconsistent and inadequate surveillance and enforcement and rent seeking by the inspectors have been expressed. Within provincial, district, and commune settings, there are problems of insufficient re-sourcing and widely differing enforcement practices and priorities. This has resulted in the business-as-usual attitudes of producers and processors who, while aware of the demand for high lean-meat ratios, do not generally pay attention to the hygiene and sanitary conditions of their products because of the lack of incentive to do so. Two factors contribute to their attitude: (1) slack enforcement mechanisms to closely monitor adherence to prevailing food safety standards, and (2) the apparent lack of market incentives that adequately compensate producers and processors for investing in compliance because of the still low level of consumer response to product labelling and certification (Lapar et al. 2003). Although consumers may be willing to pay a premium for safe good-quality pork (Ginoux 2001), that has not been widely observed in informal markets or translated into attractive returns to investment by producers and processors. Further empirical work is needed to help shed light on this issue.

## **7. CAN SMALLHOLDERS COMPETE IN THE CHANGING STRUCTURE OF CONSUMER DEMAND FOR FOOD SAFETY AND QUALITY IN PORK?**

Smallholders need to meet established food quality and safety standards and be able to have their products credibly recognized as safe to stay involved with the fast-growing pork market. This typically will require integration into high-value chains that have large-producer-like process-based food safety systems in place. Food safety will be a powerful motivator of contract farming for both small farmers and their customers.

The food safety and quality standards described in this paper are increasingly influencing the ability of producers to effectively participate and respond to the growing demand by institutional markets for certifiable and traceable safe meat products. In the Philippines, large-scale operations are implementing a sophisticated integration of breeding, high-quality internal feed formulations, farrow-to-finish operations, and HACCP-compatible methods of slaughtering and processing branded products. However, smallholders will find it too costly to meet the food quality and safety standards and have their products credibly recognized as safe. Several studies have shown that contract farming can assist farmers in acquiring the required national and international certification and accreditation (Boselie et al. 2003; Reardon and Swinnen 2004; Berdegué et al. 2005). In particular, organizational arrangements like contract farming can facilitate industry efforts to address pork-quality needs by reducing sorting and grading costs, controlling quality attributes that are difficult to measure, facilitating adaptations to changing quality standards, and reducing the transaction costs associated with relationship-specific investments in branding programs (Martinez and Zering 2004). Whether these organizational arrangements will be accessible to smallholders is an empirical issue that needs to be addressed for pro-poor policymaking.

Gulati et al. (2005) note that contract farming is the private sector solution to accomplishing credible certification of output quality in a way that distributes costs, benefits, and risks and maintains incentives for all actors to participate. A credible certification of output quality is possible because integrators ensure the supply of good quality inputs and closely monitor production activities from start to finish. This is done by optimizing production and handling practices and directly marketing items raised by contracting farmers themselves, or by branding farmers' outputs and selling them in the open market.

Producers would typically get involved in contracting to reduce capital investment and gain access to information on prices and market behavior, technology, marketing outlets, managerial skills, credit, and veterinary and extension services. The results are lower marketing and transaction costs (effected by purchasing good-quality feed and improved growing stock), reduced price risk, efficient production that increases income, improved coordination of product delivery, and optimum product quality (Glover 1984; Pasour 1998; Delgado 1999; Delgado et al. 2003).

On the other hand, integrators find contract farming attractive simply because they need to get a reliable supply of output of consistent quality. As Glover (1987) simply states, the integrators have considerable control over all the vertical stages of production, including the inputs used, the quality of the final product, and the timeliness of delivery of predetermined quantities. In addition, they can avoid complying with environmental regulations in production because that responsibility is passed on to the contract growers.

In response to the increasing demand for food safety in pork production, large processors or integrators have internal processes and procedures by which they guarantee the quality and safety of their outputs. They provide and monitor the use of all feeds, piglets, and medicines to the contractors and, to some degree, use a trace-back method to the producer to ensure quality control and a safe farm-to-table standard that operates at each stage of the supply chain—from the point of production to processing, distribution, and ultimately consumption. Therefore, they have virtually exclusive access to institutional markets (e.g., food chains, restaurants, and hotels), which have strict requirements of the meat supplied to them.

In the case of the pig industry in the Philippines, vertical integration and contract growing has not yet become the practice because only about 10 percent of the pig farms are estimated to constitute contract farms (Costales et al. 2003). As it evolved in the Philippines, contract farming may not have been motivated initially by the issues of meat quality and food safety (personal communication with a major integrator in the Philippines, February 2007). Firms ventured into contract growing because of the greater private gains they could obtain and the possibility of overcoming the several constraints to large-scale pig production. Among the constraints are the high investment cost for land and buildings and the cost of managing pig waste even before the enactment of environmental regulations. Another constraint is ensuring provision of the required volume of output. As the targeted markets became more sophisticated, the demand for meat with uniform quality (leanness, color, flavor, etc.) became an additional motivation. The more recent phenomenon of food safety regulations began to influence the market for meat at the higher end of the spectrum, and firms had to respond by making a choice between a completely insulated and fully integrated production-processing-distribution system or a more loosely organized vertically coordinated system like contract growing. However, contract growing operations do not involve the very small-scale pig producers (Costales et al 2003; Catelo 2005), because some minimum scale of production (in terms of herd size) is required. The minimum number of piglets that potential contract growers must raise to finisher stage is 200 to 400 heads, on average, at least in the case of the Philippines. Thus, contract farming schemes have limited inclusiveness and often are restricted to the “top tier” of smallholder producers (Poulton et al. 2005).

On the other hand, large-scale commercial firms in the pig sector employ vertical integration in operations from breeding and contract production to the slaughtering and processing of branded meat products. Large firms carrying brand names, with sights on niches in the export markets, have made efforts for International Organization for Standardization and HACCP recognition of their slaughterhouses and processing plants. With international certification for food quality and food safety of products, these companies have better access to large supermarkets and other formal chains in the domestic market and can supply better-grade pig meat cuts compared with smallholders (Costales et al. 2007). Although no single integrator dominates the market share of pork, vertically coordinated production, processing, and distribution entities supplying supermarkets where assurance of quality is presumed and where HACCP is granted have played an important role in improving product quality (Costales et al. 2007).

In the Thai swine industry, contract farms have become increasingly important players. However, independent farms—both the large-scale full-cycle (from-farrow-to-finish) farms and the medium-scale piglet farms—are still the largest group of farms, accounting for 72 percent of total pig farms. In 2002, the Thailand Development Research Institute conducted a survey of 174 swine farms in major pig-producing provinces in the east and northeast of Thailand and found that about 28 percent are contract farms (Poapongsakorn et al. 2003). Most of the contracts are wage contracts, with integrators bearing the price risks and sharing most of the production risks. The large integrators, such as CP, Betagro, Kanchana Fresh Group, and Belucky, are fully integrated; that is, they are involved in feed milling, pig farming, slaughtering, processing, and product marketing. Most of their investments are concentrated on machineries and technology, such as modern abattoirs that enhance their capacity to sell their products to large supermarkets and the export market.

Although the livestock industrialization study by Poapongsakorn (2003) does not focus solely on food safety and quality, it indirectly addresses those issue by assessing aspects of the quality of inputs used and the disposal and management of waste and dead animals. The study reveals that contract farms have better feed conversion ratios (1.32) compared with independent farms (2.31), which could be attributed to high-quality feed ingredients and additives, use of a hybrid pig breed capable of producing high-quality carcass meat, and good farm management practices. Moreover, large contract farms are more technically and allocatively efficient and have higher profits per unit of output than independent farms, particularly among farms engaged in pig fattening. These large contract farms also have easy access to the export and high-value domestic markets that demand high food safety standards.

In Vietnam, contract farming is a relatively recent phenomenon in the swine sector. Preliminary results of a recently concluded survey of pig producers in northern Vietnam revealed that as of end of 2005, only 34 formal contracts had been implemented by the feed companies CP of Thailand and Jappa Comfeed of Indonesia. Of the 34 farms involved in these formal contracts, six are producing piglets and 28 are fattening pigs for slaughter. It should be noted that these are relatively medium- to large-scale farms with herd sizes of more than 100 heads per batch of fatteners or at least 10 sows. The three main reasons for farmers to join contract growing schemes are (1) being assured of buyers of output, (2) having access to good-quality inputs, and (3) having a stable price for output (ILRI et al. 2007).

The integrator (i.e., CP or Jappa Comfeed) usually provides and bears the costs of assistance in infrastructure (e.g., housing in the case of contract growing in piglet production but not in fattening of slaughter pigs) and inputs such as stock (e.g., weanlings), feeds, veterinary supplies, and technical services as necessary. The contract grower provides the land for building the pigpens and the labor in day-to-day operations.

To monitor the quality of pigs produced by contract growers, the integrators generally monitor the proper specifications of pigpens, feed utilization, animal health and vaccination schedules, growth performance, and setting of optimal marketing dates for outputs. Any violations of agreed parameters by the contract grower are subject to penalties based on frequency of noncompliance. The majority of contracts that in Vietnam are fixed-fee contracts, in which fees paid to the contract growers are determined on the basis of a feed conversion ratio and mortality rate and are adjusted according to how well the grower achieved the agreed performance parameters.

Based on responses from contract growers interviewed for this study, the perceived benefits from being engaged in a formal contract with an integrator include the following, in order of importance: (1) assured buyer of output, (2) access to veterinary services, (3) access to good-quality inputs, (4) stabilized sale price of output, (5) access to technical advice, (6) improved quality of pigs (or piglets) produced, (7) reduced marketing cost, and (8) timely payment for output.

## **Case Studies**

The following paragraphs describe examples of contract farming schemes that have facilitated smallholders to meet the changing demand for certification of the use of quality inputs to produce quality outputs.

### *Philippines*

The Sorosoro Ibaba Development Cooperative (SIDC) in Southern Luzon is an example of a successful contract farming initiative that brands farmer's output (pigs) for sale in the open market (Costales et al. 2007). The cooperative also mills its own feed and provides fatteners pigs, vaccines, regular veterinary support, marketing services, and overall services for management and supervision.

The contract growers of SIDC are assured of receiving quality stock and feed from the cooperative. This effectively reduces the asymmetry of price information and transaction costs in terms of searching for good quality inputs, and enhances market transparency. The SIDC is assured that its contract growers will raise pigs with the desired characteristics that will produce good-quality because it controls breeding in its Pig Multiplier Farm, controls nutrition by providing high-quality feeds from its own feed mill, and monitors animal health through its animal health program and veterinary services. The SIDC ensures control of food safety requirements through its maintenance of a class AAA (HACCP-compatible) slaughterhouse located in Batangas City, which is open for public use and not exclusive to cooperative members. The SIDC's reputation as an institution that supplies good-quality feeds and good-quality pigs and pig meat facilitates transactions between the cooperative and its regular customers, enabling SIDC farmers to get better prices for their outputs compared with growers outside the cooperative.

Maharjan and Fradejas (2006) have studied the role of the SIDC in improving access to production resources for backyard pig producers. They have shown that the SIDC improved its members'

access to various production resources (animal stocks, feeds, and veterinary supplies) and services (marketing), which consequently improved the members' pig-raising operations. The SIDC also empowers its members to gain income, thus giving the contract growers opportunities to achieve stronger purchasing power while saving on a regular basis.

Delgado et al. (2003) estimated the profit efficiency of pig farms in Thailand and the Philippines (and Brazil) and found that contract farms producing piglets and fattening pigs were more profit efficient than farms operating independently. One of the biggest integrated pig operations (which included breeding, feed milling, pig fattening, slaughtering, meat processing, and retailing) in the Philippines has created the first HACCP- and GMP-accredited farm in response to the changing demand of consumers in terms of safe good-quality pork. The food safety and quality standards are imposed along the supply chain, from feed production to fattening pigs, the slaughtering facility, and delivery of pork to various distribution channels. Integrators, however, would prefer to contract out with large-scale farmers (with a minimum holding of 200 piglets) to minimize costs in the delivery of inputs and services and in monitoring each grower's farm management practices. Because costs are incurred on a per-grower basis, having many small farms supplying the market demand would lead to higher production costs for integrators and would require more staff to monitor and give technical advice to avoid compromising biosecurity.

### *Thailand*

In the case of poultry production in Thailand, large commercial farms and integrators provide all feeds and medicines to the subcontractors and to some degree use a method of tracing back to the producer to ensure a safe farm-to-table standard (Poapongsakorn et al. 2003). This is a self-regulatory approach to food safety control exercised by these companies to ensure that meat quality complies with industry standards and meat is free of chemical residues.

This integrated model is also in practice among most large commercial pig farms in Thailand. Production at the farm level as well as within the processing plants of every company is closely controlled and monitored. The large farms also have grandparent stock farms supplying their sow-fattener operation, either through breeding contracts for sows or contract growing for fatteners.

Processing plants are certified for application of the HACCP that ensures the safety and quality of the end product. Eight meat-processing plants are approved by the DLD for export manufacturing, including one specializing in cutting meat and one specializing in processing pork products. It is estimated that these modern processors account for 20 percent of the total slaughtering services (personal communication with Nipon Poapongsakorn, July 2007).

### *Vietnam*

A research project conducted by the Agricultural Systems Department of the Vietnam Agricultural Science Institute in 1998 encouraged local people's participation in the market through farmer participation in production development and cooperative activities (Anh and Binh 2005). This project enabled participants to gain skills in organization and bargaining to consolidate and heighten their position in the pork industry by producing high-quality pork. By 2003, farmers had successfully integrated veterinary services, input-output sales, and fodder production. In addition, a case study of a pig producer cooperative in Hai Duong revealed that collective action strategies in input procurement and animal husbandry facilitated the adoption by farmer-members of exotic pig breeds that have higher lean meat content under smallholder conditions (Vu et al. 2005). This success story facilitated the establishment of an alliance of pork cooperatives in the district, which has spread in other provinces (Bac Ninh, Hai Phong, Ha Tay, and Nam Dinh). This case study is not representative of the experiences of cooperatives or other forms of contractual arrangements of pig production and marketing in Vietnam, but it is an example of what these institutional arrangements can offer in developing a market reputation for high-quality pig meat sold by smallholder farmers who are cooperative members.



### *Challenges to Contract Farming*

The case studies presented here suggest that contract farming may be a solution for smallholders to improve their market position and increase their household incomes, thereby keeping them competitive in a rapidly growing and changing livestock market. However, there are opposing views regarding the benefits of engaging in contracts and the efficacy of involving the truly small pig producers.

Many formal contracts have a scale bias, favouring larger farms over household participation in their market coordination schemes. Thus, huge private and government investments might be required to enhance the physical capital, knowledge, and skills of smallholder pig producers (particularly those in the rural areas) to levels high enough to attract integrators and processors offering business contracts (Catelo and Costales, forthcoming).

For smallholders already engaged in contracts, an opposing view is that contract farming is perceived as a modern way of exploiting farmers. It is also perceived as perpetuating inappropriate agricultural practices (Setboonsarng 2004). Further, contract farming may expose small farmers to new risks; for example, market risks could shift from integrator to growers when the integrator-contractor refuses to compensate the growers for price differences during periods of volatile market prices. The integrator-contractor might also face production supply risks when growers refuse to deliver promised supplies or deliver pigs of a quality not consistent with agreed standards. In the Vietnam case study, for example, key informants told of undocumented cases of pig contract growers diverting inputs such as feeds from contract growing operations and using them in their own pig businesses or selling them to other pig farmers in their villages. To prevent exploitation of either the farmer or the integrator, the contract should include appropriate incentives for adhering to or penalties for violating the agreed contract terms.

## 8. IMPLICATIONS FOR POLICYMAKING

Increasing concerns about pork-related food borne diseases have led industrialized countries to develop strict food safety and quality standards, but compliance with high-technology, process-based food safety standards like HACCP is prohibitively costly for many smallholder pig producers in developing countries. Unless addressed, this situation could push small-scale pig producers, whose livelihoods depend on livestock, out of the domestic and export markets. More broadly, it could have a negative impact on income and poverty reduction.

The country case studies presented in this paper suggest that smallholders may have a chance to meet food safety and quality requirements and improve their market competitiveness by participating in contract farming schemes and operations. Contract farming has the potential to help smallholders meet the increasing demand for quality and safety in pork by (1) reducing the transaction costs of high-quality inputs (feeds and genetics) through bulk purchasing, (2) providing access to remunerative market outlets and assuring buyers of product quality, (3) providing access to information related to certification and traceability requirements in slaughterhouses, and (4) reducing assembling and hauling costs of bringing their products to market outlets. Contract farming has helped small farmers produce good-quality outputs that satisfy food safety measures through credible certification and branding that are affordable and feasible in smallholder conditions. Therefore, smallholders will not be displaced from the market if institutional arrangements (such as the SIDC in the Philippines and the pig producer cooperative in Hai Duong, Vietnam) provide market-oriented approaches to food safety, such as branding, labelling, and providing information about good production practices, and establish class AAA slaughterhouses accessible to smallholders.

A much greater effort is thus needed to find viable ways to overcome food safety constraints while increasing competitiveness for small-scale farmers, not only in informal local markets but also in export markets. One way is to invest in capacity and institution building for HACCP approaches to improve food safety at key points in the supply chain (farm production, processing, marketing, etc.). The government should adopt a strategy suited to local conditions and preferences that ensures the sustainability and cost-effectiveness of the efforts in strengthening food safety measures while integrating smallholder producers into the system (e.g., investments in HACCP-certified slaughterhouses accessible to small producers in terms of location and cost).

The private sector also plays an increasingly important role by creating a stable link between production, processing, packaging, and marketing activities. For example, large processors can strengthen their link with smallholders by implementing programs that build awareness and encourage adoption of good agricultural and manufacturing practices and HACCP standards to improve the quality and safety of the product. Intervention could target support for training pig producers on HACCP compliance and good agricultural practices.

Another alternative is to adopt a commodity-based approach to identifying barriers to global market access and identify ways to address those barriers. This involves an integrated supply chain approach that differs between product-market combinations. The system would help to define and implement the sanitary and quality requirements of potentially attractive markets for high-quality pork, including establishing key infrastructure needs and services in packinghouses and for slaughtering, packaging, transportation and storage, and marketing.

Public and animal health policies are also needed to facilitate vertical integration in such a way that it allows small-scale farmers to effectively participate in contract farming arrangements and subsequently benefit from adopting food safety and quality regulations. For example, the government should develop consumer awareness about potential risks along the supply chain and promote good manufacturing practices to encourage producers to adhere to acceptable standards of hygiene and safety in slaughtering. Further, the government should provide incentives to encourage the development and adoption of quality assurance systems that satisfy measures equivalent to international standards for

greater market recognition of contract farmers' products, particularly those of small- and medium-scale producers.

Effective surveillance, prevention, and control of zoonotic diseases (for example, FMD and pig cholera) are indispensable and require improved coordination among pig farmers, public health agencies, animal disease control officials, and organizations involved in food and water safety. Government and private organizations and even vertical integrators must help strengthen the capacities of smallholders to detect, control, and prevent animal diseases through hands-on training in detecting disease symptoms and surveillance, for example. Another requirement is systematic integration between public health infrastructure and policy as well as between human and animal health surveillance and control policies. In developing countries, smallholders have only rudimentary methods of protecting themselves from diseases and preventing transmission to neighboring farms and communities (Catelo 2006).

Implementing these programs and strategies requires joint efforts by the government and the private sector. It also demands a well-defined regulatory framework and an effective monitoring system that provides well-resourced and competent inspection authorities to ensure food safety from production to consumption. In Vietnam, for example, the Food Safety and Agricultural Health Action Plan prepared by the government has focused on a phased approach to addressing long-term institutional development needs, including strengthening public-private partnerships, to strengthen the competitiveness, quality, and safety of agricultural products, particularly livestock products. The avian influenza epidemic has contributed to focusing the attention of decision makers and the public on the urgent need to promote agricultural health and food safety and quality and their potential economic impact on farmers and the economy.

The government, therefore, must ensure the accountability of the private sector and create an enabling environment for essential partnerships (especially legal frameworks and contract enforcement) to operate efficiently and optimize the resources available to them in line with broader policy objectives, ranging from social policy to environmental protection. In turn, the private sector is assured that the regulatory system includes protection from expropriation, arbitration of commercial disputes, respect for contract agreements, and legitimate recovery of costs and profit proportional to the risks undertaken.

The private sector, including producer organizations, is expected to perform most of the market-chain functions (input provision, credit, marketing, storage, extension), while governments focus on creating a level playing field for small-scale producers, reduce high transaction costs and minimize coordination failures, or provide incentives to encourage investments from the private sector. Such private sector investments could focus on setting and enforcing standards, ensuring food safety, facilitating contract enforcement, providing public investments, negotiating trade matters, organizing safety nets for marginal groups, defining access to and management arrangements for natural resources, and providing agricultural statistics and timely information on markets, among others things.

## APPENDIX A: FIVE BASIC GUIDING PRINCIPLES IN THE DEVELOPMENT OF FOOD SAFETY AND AGRICULTURAL HEALTH STRATEGIES

The following five basic principles currently guide the development of food safety and agricultural health strategies in many parts of the world and are also being applied in the developing countries (Caswell 2003):

1. The *farm-to-table concept* for food safety focuses on the prevention of quality and food safety risks at all stages of production, marketing, processing, retailing, and consumption. This concept emphasizes the vital importance of including all players in the supply chain, from the agricultural input providers and farmers to consumer households.
2. The *integrated agricultural health safeguarding system concept* provides integral, seamless systems for protection of food from alien pests and diseases through exclusion, surveillance, control and eradication, and certification activities.
3. The *risk analysis concept* uses risk management, risk assessment, and risk communication to help decision makers (risk managers) decide on strategies and priorities in addressing food safety and agricultural health threats on the basis of scientific principles that consider the many needs and requirements of the supply chain, monitor and evaluate their implementation, and communicate with stakeholders to ensure that the analysis and decisions taken address the appropriate priorities.
4. The *Hazard Analysis Critical Control Point concept* focuses on verifiable controls of food-handing processes to help decision makers take appropriate corrective actions. The use of this approach in the food industry became mandated in the EU for all supply chains, and for some in the United States, including juice, fish, and meat. HACCP is increasingly required for developing countries that export food products into the EU, leading to the incorporation of HACCP principles into Codex's food hygiene codes starting in 1995. HACCP transfers the first responsibility for quality and food safety to the producers and processors.
5. A *broad-based institutional approach* that seeks to improve the overall institutional and regulatory framework rather than a commodity-specific approach. The framework will provide stakeholders in a particular food chain with a solid foundation for coordination and development of commodity-specific efforts based on market demand, risks imposed, and stakeholder needs.

**APPENDIX B: SELECTED POLICIES ON FOOD SAFETY AND QUALITY  
AFFECTING SWINE AND POULTRY PRODUCERS IN THE PHILIPPINES**

<b>Legal Basis</b>	<b>Title</b>	<b>Year of Promulgation</b>	<b>Salient Provision</b>
R.A. 3720	Food, Drug, and Cosmetic Act	1987	Provides for the “adoption of measures to ensure the pure and safe supply of food, to protect the health of the people and for the promulgation of food standards.”
DA A.O. No. 39, S. 2000	Amended Rules and Regulations Governing Importation of Meat and Meat Products into the Philippines	2000	“Rules and regulations to prevent the entry of disease-carrying, contaminated, and/or adulterated meat and/or meat products, which endanger the lives and safety/health of the consuming public and which could lead to potentially serious economic consequences to the livestock and poultry and related industries.”
R.A. 8435, Ch. 7	Establishment of Bureau of Agriculture and Fisheries Product Standards as mandated by the Agriculture and Fisheries Modernization Act.	1997	Provides for “product standardization and food safety.”
DA A.O. No.1, S.2000	Banning and Withdrawal of Olaquinox and Carbadox from the Market	2000	Banning of these “anti-microbial drugs used in livestock production to reduce salmonella shedding in animals because of long withdrawal periods of about 70 days”
Memorandum Order 7	Hazard Analysis Critical Control Point (HACCP) Audit of Meat and Milk Plants	2002	Mandates an HACCP audit of all meat and milk plants exporting products to the Philippines by third-party auditors/inspectors.
DA. A.O. No. 23, S. 2005	Revised Guidelines for the Accreditation of Swine Breeder Farms	2002	The certification to be issued by the auditor/inspector will be the basis for allowing the meat and milk plants to export to the Philippines.
DA A.O. No. 24, S. 2005	General Guidelines and Requirements of the Quality Control Laboratory Accreditation of Commercial and Non-Commercial Feed Manufacturers, Veterinary Drug Manufacturers and for Feed and Drug Service Laboratories	2005	“To identify, accredit and promote swine farms with quality genetics and improved breeder stock and sustain the advanced status of the swine industry by ensuring the availability and distribution of good quality breeder stock particularly among backyard farmers.”

<b>Legal Basis</b>	<b>Title</b>	<b>Year of Promulgation</b>	<b>Salient Provision</b>
DA A.O. No 26, S. 2005	Revised Rules, Regulations, and Standards Governing the Importation of Meat and Meat Products into the Philippines	2005	Provides for inspection of laboratory premises of feed and veterinary drug manufacturers/services by the Bureau of Animal Industry.
DA A.O. No. 30, S. 2005	Amendment to A.O. No. 19, S of 2003 re: Compliance to Good Manufacturing Practice	2005	More “comprehensive, strengthened and transparent set of rules, regulations and standards governing the importation of meat and meat products to facilitate trade without compromising the safety and quality of imported meat and meat products and viability of existing industries” in view of recent avian flu outbreaks.
DA. A.O No. 35, S. 2005	Regulating the Movement of Foot and Mouth Disease (FMD)-Susceptible Animals, Meat, Meat Products and Its By-Products into Region I and the Cordillera Administrative Region (CAR)	2005	Requiring all drug-manufacturing plants/labs of animal health products to comply with internationally recognized standards of current GMP set by Codex; WHO; and the Food, Drugs, Devices, and Cosmetic Act.
DA A.O. No 36, S. 2005	Declaration of Regions I, CAR (except Benguet), and the Province of Aurora as FMD-Free Zones with Vaccination and the Provinces of Bataan, Tarlac, Pampanga, Zambales, Cavite, Quezon, and Rizal as Protected Zones	2006	Regulating entry of meat and meat by-products from FMD-endemic areas of Regions III and IV and National Capital Region into Protected Areas of Region I and CAR to maintain the latter’s status as FMD free and preparation for local declaration as FMD-Free Zone. Declaring said areas as FMD-Free Zones and Protected Areas “to strengthen the campaign against FMD and further enhance the livestock industry in the said areas

Sources: Catelo (2002).

## REFERENCES

- Anh, D.T., and V.T. Binh. 2005. Agriculture contracts, cooperative action by farmers, and poor people's participation in northern Vietnam. Paper presented at Asian Development Bank workshop on Linking Farmers to Markets through Contract Farming, Hanoi, Vietnam.
- Baumann, P. 2000. *Equity and efficiency in contract farming schemes: The experience of agricultural tree crops*. Working Paper No. 139, Overseas Development Institute, London.
- Berdegúe, J.A., F. Balsevich, L. Flores, and T. Reardon. 2005. Central American supermarkets: Private standards of quality and safety procurement of fresh fruits and vegetables. *Food Policy* 30 (3): 254–269.
- Boselie, D., S. Henson, and D. Weatherspoon. 2003. Supermarket procurement practices in developing countries: Redefining the roles of the public and private sectors. *American Journal of Agricultural Economics* 85 (5): 1155–1161.
- Bureau of Agricultural Statistics. 2005. <http://www.bas.gov.ph> or [http://www.da.gov.ph/wps/portal/da/offices?WCM\\_GLOBAL\\_CONTEXT=/wps/wcm/connect/DA+Site/DA+Offices/Bureaus/](http://www.da.gov.ph/wps/portal/da/offices?WCM_GLOBAL_CONTEXT=/wps/wcm/connect/DA+Site/DA+Offices/Bureaus/)
- Buzby, J.C., ed. 2003. *International trade and food safety: Economic theory and case studies*. Agricultural Economic Report No. 828, Economic Research Service, U.S. Department of Agriculture (USDA). <http://www.ers.usda.gov/Publications/AER828/>.
- Caswell, J.A. 2003. Trends in food safety standards and regulation: Implications for developing countries. Brief No. 4 in *Food Safety in Food Security and Food Trade*, 2020 Focus No. 10, ed. L.J. Unnevehr. Washington, DC: International Food Policy Research Institute (IFPRI). [http://www.ifpri.org/2020/focus/focus10/focus10\\_04.pdf](http://www.ifpri.org/2020/focus/focus10/focus10_04.pdf).
- Catelo, M.A.O. 2002. Issues and policy options for addressing environmental and human health risks associated with growth in small- and large-scale swine and poultry production in the Philippines. Annex VI in final report of IFPRI-FAO Industrialization Project. Washington, DC: IFPRI.
- . 2005. Determinants of environmental mitigation expenditures in hog and poultry farms in the Philippines. Professorial chair lecture at University of the Philippines, Los Banos.
- . 2006. Livestock and health. Brief 9 in *Understanding the Links between Agriculture and Health*, 2020 Focus No. 13, ed. C. Hawkes and M. Ruel. Washington, DC: IFPRI. [http://www.ifpri.org/2020/focus/focus13/focus13\\_09.pdf](http://www.ifpri.org/2020/focus/focus13/focus13_09.pdf).
- Catelo, M.A.O., and A.C. Costales. Forthcoming. Contract farming and other market institutions as mechanisms for integrating smallholder livestock producers in the growth and development of the livestock sector in developing countries. Working paper, FAO Pro-Poor Livestock Policy Initiative, Rome, Italy..
- Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration. 2004. Healthy people 2010 focus area data project review: Focus area 10: Food safety: Challenges, barriers, strategies, and opportunities. Available at <http://www.foodsafety.gov/~dms/hp2010.html>
- Coase, R.H. 1937. The nature of the firm. *Economica* 4: 386–405.
- Costales, A.C., C. Delgado, M.A.O. Catelo, M. Tiongco, et al. 2003. Policy, technical, and environmental determinants and implications of the scaling-up of broiler and swine production in the Philippines. Annex I in final report of IFPRI-FAO Livestock Industrialization Project: Phase II. Washington, DC: IFPRI.
- Costales, A.C., C. Delgado, M.A.O. Catelo, L. Lapar, et al. 2007. *Scale and access issues affecting smallholder hog producers in an expanding peri-urban market: Southern Luzon, Philippines*. Research Report No. 151, IFPRI, Washington, DC.
- Costales, A., P. Gerber, and H. Steinfeld. 2006. Underneath the livestock revolution. In *Livestock Report 2006*. Rome: FAO. <http://www.fao.org/docrep/009/a0255e/a0255e00.htm>.
- Crutchfield, S.R., J.C. Buzby, T. Roberts, M. Ollinger, and C.T. Jordan Lin. 1997. *An economic assessment of food safety regulations: The new approach to meat and poultry inspection*. Agricultural Economic Report No. 755, Economic Research Service, USDA. <http://www.ers.usda.gov/Publications/AER755/>.

- Da Silva, C.A. 2005. *The growing role of contract farming in agri-food systems development: Drivers, theory, and practice*. Rome: Agricultural Management, Marketing, and Finance Service, FAO.
- Delgado, C.L. 1999. Sources of growth in smallholder agriculture in Sub-Saharan Africa: The role of vertical integration of smallholders with processors and marketers of high value-added items. *Agrekon* 38: 165-189.
- . 2005. ILRI [International Livestock Research Institute]-IFPRI Joint Program on Livestock Market Opportunities [business plan].  
[http://www.ilri.org/ILRIPubAware/Uploaded%20Files/2004891111540.03BR\\_FS\\_ILRI-IFPRIjointProgramForLivestockMarketOpportunities.pdf](http://www.ilri.org/ILRIPubAware/Uploaded%20Files/2004891111540.03BR_FS_ILRI-IFPRIjointProgramForLivestockMarketOpportunities.pdf).
- Delgado, C., C. Narrod, and M. Tiongo. 2003. *Policy, technical, and environmental determinants and implications of the scaling-up of livestock production in four fast-growing developing countries: A synthesis*. Final report of the IFPRI-FAO Livestock Industrialization Project: Phase II. Washington, DC: IFPRI.
- . 2008. *Determinants and implications of the growing scale of livestock farms in four fast-growing developing countries*. Research Report No. 157, IFPRI, Washington, DC.
- Delgado C.L., 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, Washington, DC.
- Delgado, C., and M. Tiongo. 2005. Contract farming of milk and poultry in India: Partnerships to promote the environmentally friendly and equitable intensification of smallholder market-oriented livestock production. Project proposal submitted by IFPRI to FAO and International Fund for Agricultural Development (IFAD), Washington, DC.
- Department of Agriculture, Republic of the Philippines. 2006. *Implementing rules and regulations of Executive Order 481 for the promotion and development of organic agriculture in the Philippines*.  
[http://bafps.da.gov.ph/dox/EO\\_481\\_IRR.pdf](http://bafps.da.gov.ph/dox/EO_481_IRR.pdf).
- Department of Livestock Development. 2006. Thailand Statistics.  
<http://www.sawadee.com/thailand/statistics/index.htm>. Accessed on December 2006.
- Digal, L.N. and S. B. Concepcion. 2004. *Regoverning Markets: Securing Small Producer Participation in Restructured National and Regional Agri-food Systems*. London, U.K.: Regoverning Markets. Available on line at [www.regoverningmarkets.org](http://www.regoverningmarkets.org).
- Du, Wayne. 2000. Q-tips for Pork Quality and Safety  
[http://www.omafra.gov.on.ca/english/livestock/swine/facts/info\\_qs\\_qtips.htm](http://www.omafra.gov.on.ca/english/livestock/swine/facts/info_qs_qtips.htm)
- Food and Agriculture Organization (FAO), Statistics Division. 2008. Food balance sheets.  
<http://www.fao.org/es/ess/fbslead.asp>.
- . 1999. The importance of food quality and safety in developing countries. Available at:  
[http://www.fao.org/trade/docs/LDC-foodqual\\_en.htm](http://www.fao.org/trade/docs/LDC-foodqual_en.htm)
- Figuie, M., N. Bricas, V.P.N. Thanh, N.D. Truyen. 2004. Hanoi's consumers' point of view regarding food safety risks: An approach in terms of social representation. Paper presented at XI World Congress of Rural Sociology, Trondheim, Norway.
- Ginhoux, V. 2001. Etude de la sensibilité des consommateurs urbains de viande porcine. Programme d'Appui à l'Organisation de la Production Agricole, Programme Fleuve Rouge. GRET, VASI, VSF, CIRAD, Hanoi, Vietnam.
- Glover, David J. 1984. Contract farming and smallholder outgrower schemes in less-developed countries. *World Development* 12 (11/12): 1143–1157.
- . 1987. Increasing the benefits to smallholders from contract farming: Problems for farmers' organizations and policy makers. *World Development* 15 (4): 441–448.
- Gulati, A., N. Minot, C. Delgado, and S. Bora. 2005. Growth in high-value agriculture in Asia and the emergence of vertical links with farmers. Paper presented at symposium on Toward High-Value Agriculture and Vertical Coordination: Implications for Agribusiness and Smallholders, Pusa, New Delhi.



- Hall, D., S. Ehui, and C. Delgado. 2004. The Livestock revolution, food safety, and small-scale farmers: why they matter to us all? *Journal of Agricultural and Environmental Ethics* 17: 425-444. Netherlands: Kluwer Academic Publishers.
- Hobbs, J., and L. Young. 2001. *Vertical linkages in agri-food supply chains in Canada and the United States*. Ottawa, Ontario: Research and Analysis Directorate (RAD) Strategic Policy Branch, Agriculture and Agri-Food Canada. [http://www2.montana.edu/lmyoung/pdf-files/vrtcl\\_e.pdf](http://www2.montana.edu/lmyoung/pdf-files/vrtcl_e.pdf).
- ILRI, Hanoi Agricultural University, IFPRI, and FAO 2007. *Contract farming for equitable market-oriented smallholder swine production in northern Vietnam*. A project report of the Contract Farming of Swine Production in Northern Vietnam project. International Livestock Research Institute, Nairobi, Kenya.
- Jensen, H.H., and L.J. Unnevehr. 2000. HACCP in pork processing: Costs and benefits. In *The Economics of HACCP: Studies of Costs and Benefits*, ed. L.J. Unnevehr, 29–44. Saint Paul, MN: Eagan Press.
- Key, N., and D. Runsten. 1999. Contract farming, smallholders, and rural development in Latin America: The organization of agro-processing firms and the scale of outgrower production. *World Development* 27 (2): 381–401.
- Kim, P.T. 2002. Food safety activities in Vietnam. Paper presented at the FAO/WHO Global Forum of Food Safety Regulators, Marrakech, Morocco. <http://www.fao.org/docrep/meeting/004/ab532e.htm>.
- Lapar, M.L., T.B. Vu, and S. Ehui. 2003. *Identifying barriers to entry to livestock input and output markets in Southeast Asia*. Socioeconomics and Policy Working Paper Series No. 56, Livestock Sector Analysis and Policy Branch, FAO. [http://www.fao.org/ag/againfo/resources/en/publications/sector\\_reports/lsr\\_VNM.pdf](http://www.fao.org/ag/againfo/resources/en/publications/sector_reports/lsr_VNM.pdf).
- Maharjan, K., and C. Fradejas. 2006. The role of cooperatives in improving accessibility to production resources and household economy of backyard pig raisers in Batangas, Philippines. Poster presented at the 26th Conference of the International Association of Agricultural Economists (IAAE), Brisbane, Australia.
- Minot, N.W. 1986. *Contract farming and its effect on small farmers in less developed countries*. International Development Working Paper No. 31, Department of Agricultural Economics, Michigan State University, East Lansing.
- Nation*. 2007. Late news: Pork exports to increase by 9%. May 15. [http://www.nationmultimedia.com/2007/05/15/business/business\\_30034218.php](http://www.nationmultimedia.com/2007/05/15/business/business_30034218.php).
- National Statistical Coordination Board (NSCB). 2005. 2003 Family Income and Expenditure Survey results. Special Release No. 142. <http://www.census.gov.ph/data/sectordata/fie03frtx.html>.
- Pasour, E.C. 1998. The potential impact of increased vertical integration on North Carolina grain farmers. North Carolina State University, Raleigh.
- Peterson, H.C., and A. Wysocki. 1997. *The vertical coordination continuum and the determinants of firm-level coordination strategy*. Staff Paper No. 97-64, Michigan State University, East Lansing.
- Pingali, P. 2004. *Westernization of Asian diets and the transformation of food systems: Implications for research and policy*. ESA Working Paper No. 04-17, Agricultural and Development Economics Division (ESA), FAO, Rome.
- Poapongsakorn, N., V. NaRanong, C. Delgado, et al. 2003. Policy, technical, and environmental determinants and implications of the scaling-up of swine, broiler, layer, and milk production in Thailand. Annex IV in final report of IFPRI-FAO Livestock Industrialization Project: Phase II. Washington, DC: IFPRI.
- Poppo, L., and T. Zenger. 2002. Do formal contracts and relational governance function as substitutes or complements? *Strategic Management Journal* 23 (8): 707–725.
- Poulton, C., A. Dorward, and J. Kydd. 2005. The future of small farms: New directions for services, institutions, and intermediation. In *The Future of Small Farms: Proceedings of a Workshop*, 223–251. Washington, DC: IFPRI.
- Reardon, T., and J. Swinnen. 2004. Agrifood sector liberalization and the rise of supermarkets in former state-controlled economies: A comparative overview. *Development Policy Review* 22 (5): 515–523.

- Reardon, T. and Timmer, P.C. 2005. Transformation of Markets for Agricultural Output in Developing Countries since 1950: How Has Thinking Changed? In *Handbook 12 of Agricultural Economics*, Vol. 3A, ed. R. Evenson, P. Pingali and T. P. Schultz. Amsterdam: Elsevier.
- Reardon, T., C.P. Timmer, C.B. Barrett, J. Berdegue. 2003. The Rise of Supermarkets in Africa, Asia, and Latin America. *American Journal of Agricultural Economics* 85 (5), December: 1140-1146.
- Regmi, A., M.S. Deepak, J.L. Seale Jr., and J. Bernstein. 2001. Cross-country analysis of food consumption patterns. In *Changing Structure of Global Food Consumption and Trade*, ed. A. Regmi. Agriculture and Trade Report No. WRS-01-1, Market and Trade Economics Division, Economic Research Service, USDA, Washington, DC.
- Rehber, E. 2000. Vertical coordination in the agro-food industry and contract farming: A comparative study of Turkey and the USA. Research Report No. 52, Food Marketing Policy Center, University of Connecticut, Storrs.
- Setboonsarng, S. 2004. Role of contract farming in poverty reduction: Ongoing Research in Lao PDR and Cambodia under RETA 6112; Making markets work better for the poor. Presentation at the Regional Research Workshop on Contract Farming and Poverty Reduction: Issues and Research Methodology, Bangkok, Thailand.
- Umali-Deininger, D., and M. Sur. 2006. Food safety in a globalizing world: Opportunities and challenges for India. Plenary paper presented at 26th Conference of the IAAE, Brisbane, Australia.
- Unnevehr, L. 2003. Food safety in food security and food trade: Overview. Brief 1 in *Food Safety in Food Security and Food Trade*, 2020 Focus No. 10, ed. L. Unnevehr. Washington, DC: IFPRI.  
[http://www.ifpri.org/2020/focus/focus10/focus10\\_01.pdf](http://www.ifpri.org/2020/focus/focus10/focus10_01.pdf).
- USDA (United States Department of Agriculture). 2002. "Thailand Retail Food Sector Report" GAIN Report. Foreign Agricultural Service, U.S. Department of Agriculture. Washington, D.C.
- Vu, T.B, T. V. Tuan, and L.V. Ly. 2005. Institutional innovations for improving small household's participation in livestock production: The case of pig producer cooperatives in Hai Duong province, Vietnam. Final report. Los Baños, Laguna, Philippines: ILRI.
- Weatherspoon, D.D. and T. Reardon. 2003. The Rise of Supermarkets in Africa: Implications for Agrifood Systems and the Rural Poor. *Development Policy Review* 21(3): 333-355.
- Williamson, O.E. 1979. Transaction cost economics: The governance of contractual relations. *Journal of Law and Economics* 22: 233-262.
- . 1985. *The Economic Institutions of Capitalism*. New York: Free Press.
- . 1989. Transaction cost economics. In vol. 1 of *Handbook of Industrial Organization*, ed. R. Schmalensee and R. Willig. Amsterdam: North-Holland.
- . 2000. The new institutional economics: Taking stock, looking ahead. *Journal of Economic Literature* 38: 595-613.
- World Bank. 2006a. Vietnam food safety and agricultural health action plan. Report No. 35231VN.  
[http://siteresources.worldbank.org/INTVIETNAM/Resources/vietnam\\_sps\\_report\\_final\\_feb\\_06.pdf](http://siteresources.worldbank.org/INTVIETNAM/Resources/vietnam_sps_report_final_feb_06.pdf).
- . 2006b. World Development Indicators. <http://www.worldbank.org/>.
- World Health Organization (WHO). 2002. *Food safety and foodborne illness*. Fact Sheet no. 237, WHO, Geneva.

## RECENT IFPRI DISCUSSION PAPERS

For earlier discussion papers, please go to [www.ifpri.org/pubs/pubs.htm#dp](http://www.ifpri.org/pubs/pubs.htm#dp).  
All discussion papers can be downloaded free of charge.

778. *On-site and off-site long-term economic impacts of soil fertility management practices: The case of maize-based cropping systems in Kenya.* Ephraim Nkonya, Patrick Gicheru, Johannes Woelcke, Barrack Okoba, Daniel Kilambya, and Louis N. Gachimbi, 2008.
777. *Development under conditions of inequality and distrust: Social cohesion in Latin America.* Marco Ferroni, Mercedes Mateo, Mark Payne, 2008.
776. *Exploring strategic priorities for regional agricultural R&D investments in East and Central Africa.* Liangzhi You and Michael Johnson, 2008.
775. *Reforming the agricultural extension system in India: What Do We know about what works where and why?* Katharina Raabe, 2008.
774. *An experimental inquiry into the effect of yardstick competition on corruption.* Angelino Viceisza, 2008.
773. *Alianzas para la innovación agroalimentaria en Bolivia: Lecciones para la formulación de políticas.* Frank Hartwich, Luis Ampuero, Tito Arispe, Vicente Eiguez Jaime Mendoza, y Nancy Alexaki, 2008.
772. *Tracing power and influence in networks: Net-Map as a tool for research and strategic network planning.* Eva Schiffer and Douglas Waale, 2008.
771. *Estimating household income to monitor and evaluate public investment programs in Sub-Saharan Africa.* Samuel Benin and Josee Randriamamonjy, 2008.
770. *Does Africa trade less than it should, and if so, why? The role of market access and domestic factors.* Antoine Bouet, Santosh Mishra, and Devesh Roy, 2008.
769. *Impacts of the Hutan Kamasyarakatan social forestry program in the Sumberjaya Watershed, West Lampung District of Sumatra, Indonesia.* John Pender, Suyanto, John Kerr, and Edward Kato, 2008.
768. *Finance and cluster-based industrial development in China.* Jianqing Ruan and Xiaobo Zhang, 2008.
767. *Introducing a genetically modified banana in Uganda: Social benefits, costs, and consumer perceptions.* José Falck-Zepeda, Enoch Kikulwe, and Justus Wesseler, 2008.
766. *Global macroeconomic developments and poverty.* Eugenio Diaz-Bonilla, 2008.
765. *Economic partnership agreements between the European union and African, Caribbean, and Pacific countries: What is at stake for Senegal.* Valdete Berisha-Krasniqi, Antoine Bouet and Simon Mevel, 2008.
764. *Marriage behavior response to prime-age adult mortality: Evidence from Malawi.* Mika Ueyama and Futoshi Yamauchi, 2008.
763. *Impacts of inventory credit, input supply shops, and fertilizer microdosing in the drylands of Niger.* John Pender, Tahirou Abdoulaye, Jupiter Ndjeunga, Bruno Gerard, and Edward Kato, 2008.
762. *Plant genetic resources for agriculture, plant breeding, and biotechnology : Experiences from Cameroon, Kenya, the Philippines, and Venezuela.* José Falck-Zepeda, Patricia Zambrano, Joel I. Cohen, Orangel Borges, Elcio P. Guimarães, Desiree Hautea, Joseph Kengue, and Josephine Songa, 2008.
761. *How change agents and social capital influence the adoption of innovations among small farmers: Evidence from social networks in rural Bolivia.* Mario Monge, Frank Hartwich, and Daniel Halgin, 2008.
760. *Gender Difference in the Long-Term Impact of Famine.* Ren Mu and Xiaobo Zhang, 2008.
759. *Rural innovation systems and networks: Findings from a study of Ethiopian smallholders.* David J. Spielman, Kristin E. Davis, Martha Negash, and Gezahegn Ayele, 2008.
758. *A Tale of two countries: spatial and temporal patterns of rice productivity in China and Brazil.* Liangzhi You, 2008.
757. *Must conditional cash transfer programs be conditioned to be effective? The impact of conditioning transfers on school enrollment in Mexico.* Alan de Brauw and John Hoddinott, 2008.

**INTERNATIONAL FOOD POLICY  
RESEARCH INSTITUTE**

**[www.ifpri.org](http://www.ifpri.org)**

**IFPRI HEADQUARTERS**

2033 K Street, NW  
Washington, DC 20006-1002 USA  
Tel.: +1-202-862-5600  
Fax: +1-202-467-4439  
Email: [ifpri@cgiar.org](mailto:ifpri@cgiar.org)

**IFPRI ADDIS ABABA**

P. O. Box 5689  
Addis Ababa, Ethiopia  
Tel.: +251 11 6463215  
Fax: +251 11 6462927  
Email: [ifpri-addisababa@cgiar.org](mailto:ifpri-addisababa@cgiar.org)

**IFPRI NEW DELHI**

CG Block, NASC Complex, PUSA  
New Delhi 110-012 India  
Tel.: 91 11 2584-6565  
Fax: 91 11 2584-8008 / 2584-6572  
Email: [ifpri-newdelhi@cgiar.org](mailto:ifpri-newdelhi@cgiar.org)