Global Food Chains and Environment: A Case Study of Frozen Chicken Industry in Thailand

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Abstract

Thailand is the world's fourth largest and Asia's largest exporter of frozen chicken meat, earning the country almost USD 1,000 million in foreign exchange every year. The frozen chicken meat industry in Thailand has made substantial adjustment in response to the importers of frozen chicken meat and chicken meat products in the global market who have demanded that the products are assured for safety, free of contaminants, have high quality standards, and the use environmentally friendly practices throughout the production process. Farm level production is now supervised closely by both the processing companies and the Department of Livestock Development. All chicken meat products are certified for going through the HACCP system. International importers inspect the processing facilities 1–3 times a year for assurance. All companies in case study have clear responsible divisions for environment management, although the large–sized companies can perform relatively better. Their wastewater quality after treatment satisfies the standards of the Department of Industrial Works. The solid wastes from production processes are efficiently handled. Many associations involving poultry husbandry have assisted farmers and exporters in terms of gaining information and problem-solving. The factors that the frozen chicken meat exporting companies perceive to be the driving forces for improving production processes and adopting new technologies are the pressure from importers in the global market, the enforcement of state laws, the companies' own awareness, and the policies of the parent company.

Introduction

Thailand, traditionally an agricultural country and a major food exporter, is undergoing rapid rate of structural change and industrial growth. While decreasing as a share of GDP, agricultural products occupied the top position in exports until being unseated by industrial products in the 1990s. Since the 1970s the favorable climate for agro-industry was led to the development of exports besides rice such as rubber, sugar, and broiler chicken, making this the most important domestic industry. In the 1980s, shrimp farming began, and frozen shrimp export to Japan and USA grew rapidly. Thailand's food processing industry has been developing at a rapid rate throughout the past decade despite suffering a slight setback during the 1997-1998 recession. Future prospects for growth in this sector are excellent, as Thailand is able to capitalize on an abundant supply of raw materials from local agricultural production and is rich in natural resources. Thailand is one of the few countries in the Asia Pacific region that has the capacity to produce more food than it consumes (Canadian Embassy in Bangkok, 2000). Thailand is one of the world's leading producers and an exporter of processed food products and is home to more than 7,000 food processors. Most of these firms are small and medium size companies, which for the most part are serving the domestic market. The larger companies are generally geared towards producing for the export market and, accordingly, must produce products of a quality necessary to meet international standards. Thailand's food processing sector is heavily export-oriented with about 50 % of production sold out of the country.

The global trade agreement GATT/TRIPS under the WTO, and various International Standards e.g. Codex Alimentarius Standard, ISO 9001, ISO 14000, encourage concern about products' quality, and appropriate waste management, as well as environmental protection. Consumers, especially in the EU and the USA market are increasingly concerned about the safety of their food. The EU common market is consolidating and harmonizing the rules for food safety and labeling, and Canada, Mexico and the USA are taking steps to harmonize regulation within the North American Free Trade Agreement (NAFTA). Processors, like Thailand, who export to the two largest blocks of food importers have to look for options to cost-effectively comply with import regulations or face costly rejections (Humpal and Guenette, 2000). These standards need to be considered as an immediate requirement if access to the worldwide markets is an objective. For developing countries, the stakes are important because food exports can contribute to rural growth and poverty alleviation.

Thailand's processed food exports will face the pressures and constraints at the global trade level. However, domestically, Thailand has also a growing public awareness of environmental problems, particularly among the professional class and higher income group in Bangkok. Almost all ranks of the influential middle class in Thailand demand a higher quality of life to accompany their rising per capita income. Environmental issues and public health concern will continue to dominate political and economic agenda, with the environmental issues and events receiving greater media coverage and publicity. Clearly, there is a growing support in Thailand for improving environmental legislation and enforcement. International pressures, linked to global and regional environmental concern, are also driving domestic environmentally sensitive markets. International trade agreements and alliances will further encourage vigorous enforcement of Thailand's new, tougher environmental laws. Particularly significant is the growing trend towards standardization under the ISO 14000 regime (BOIOT, 2000).

The Thai Government has declared 2004 the "Year of Food Safety" while other countries have imposed stringent measures for hygienic standards of food from Thailand and may even apply trade protectionism against items considered unsafe to consume (Food safety standards to be strictly observed for agricultural exports, 2003: Online).

The officials responsible for food safety and quality in Thailand are the Department of Medical Science, the Thai Industrial Standards Institute, the Department of Agriculture, the Department of Fisheries and the Department of Livestock Development. These are the authorized certifying agencies of food safety and quality system implementations in Thailand. However, with the implementation of the WTO Agreements, major markets started requiring that exporting countries have HACCP certifications to ensure product safety. The requirement comes with third party HACCP certification as well.

In an effort to foster food safety production among the Thai food industries and to be more competitive in the world markets, the National Food Institute (NFI) in collaboration with the Biotechnology Center of the National Science and Development Agency and in conjunction with the internationally accredited Campdem and Chorleywood Food Research Associations (CCFRA) of UK, has implemented the HACCP program. Under this program, CCFRA-certified NFI experts have been providing consultations related to HACCP designs and documentation as well as process monitoring, while final audit and factory HACCP certification are provided by the CCFRA Experts (Thai Food Industry, 2003: Online).

The frozen chicken industry is an example in this study. Frozen chicken producers in Thailand face similar pressures to adapt their production processes and products towards more environmentally sound ones. But not all frozen chicken producers feel this pressure to the same extent, nor do all frozen chicken producing industries react to a similar extent to these pressures. This paper focuses on the following research questions: How do the Thai farmers arrange and practice in broiler production on the farm level? How have the entrepreneurs improved their production processes on the factory level? How does the production on the farm and factory level affect the surrounding communities? How do the surrounding communities respond? How does the government sector, especially the Department of Livestock and Development and Department of Industrial Works, play a role and support broiler production and frozen chicken processing? How do the associations related to this industry support and help the farmers and entrepreneurs?

Chicken production

The largest chicken production area is the central region which accounts for more than half of the national production, followed by the northeastern, the northern and the southern regions, respectively. The output share of the central region has increased from 49.7% in 1998 to

55.69% in 2002. The share of northeastern region has remained quite stable at 24.58% in 1998 and 24.67% in 2002. Production in the north has declined from 15.35% share in 1998 to 12.62% in 2002, similar to the situation in the south with a reduction from 10.35% to 7.10% in the respective years. At the national level, however, chicken production has increased from 773.52 million birds in 1998 to 1,025.41 million birds in 2002 with an annual growth rate of 5.89% (Table 1)

Table 1 Number of Thai broilers classified by region in 1998 - 2002

Unit: million birds

Year	Region				Whole kingdom	% change
	Central	Northeastern	Northern	Southern		
1998	384.58 (49.72)	190.12 (24.58)	118.73 (15.35)	80.09 (10.35)	773.52 (100.00)	-
1999	388.78 (46.02)	235.11 (27.83)	136.09 (16.11)	84.79 (10.04)	844.77 (100.00)	9.21
2000	492.86 (52.27)	223.89 (23.74)	138.97 (14.74)	87.19 (9.25)	942.91 (100.00)	11.62
2001	501.14 (52.01)	242.52 (25.17)	138.17 (14.34)	81.71 (8.48)	963.54 (100.00)	2.19
2002	571.10 (55.69)	252.94 (24.67)	128.57 (12.54)	72.80 (7.10)	1,025.41 (100.00)	6.42
Average	(51.14)	(25.20)	(14.62)	(9.04)	(100.00)	5.89

Sources : Department of Livestock Development and Calculated
Note : Number in parenthesis is percentage

In terms of chicken farmers, most farms are located in the central region and account for more than half of the total farms nationwide. However, the proportion of farms in this region tends to decrease as suggested by the 60.38% share in 1996 becoming 57.50% in 2002. The proportion of chicken farms in the northeast has dropped slightly from 18.00% level in 1996 to about 16% in 2002. Similarly, the share of chicken farms in the south decreased from 16.59% in 1996 to 11.57% in 2002. Only the northern region has experienced the expansion of chicken farming from 5.03% in 1996 to 14.93% of total farms in 2002. Nationwide, the total number of chicken farms increased from 3,816 farms in 1996 to 18,649 farms in 2002. However, the rate of growth between 1997 and 1999 is quite remarkable at 112.37% (Table 2), due to low business in the economic crisis period in 1997, the change in exchange rate, and the mad-cow disease incident in the latter period which caused the EU countries' consumers to switch their consumption to chicken meat, thus stimulating the expansion of chicken farming in Thailand to a larger extent.

Table 2 Number of chicken farms in Thailand, classified by region in 1996 -2002

Unit: farms

Year	Region				Total	% change
	Central	Northern	Northeastern	Southern		
1996	2,304 (60.38)	192 (5.03)	687 (18.00)	633 (16.59)	3,816 (100.00)	-
1997	3,083 (55.76)	393 (7.11)	1,270 (22.97)	783 (14.16)	5,529 (100.00)	44.89
1999	7,162 (60.99)	1,003 (8.54)	2,132 (18.16)	1,445 (12.31)	11,742 (100.00)	112.37
2000	9,239 (49.02)	4,185 (22.21)	3,260 (17.30)	2,161 (11.47)	18,845 (100.00)	60.49
2002	10,723 (57.50)	2,784 (14.93)	2,985 (16.00)	2,157 (11.57)	18,649 (100.00)	-1.04

Source : Provincial Livestock Office

Collected By : Information and Statistics Group, Information Technology Center, Department of Livestock Development, Thailand

Note : 1. No survey in 1998 and 2001

2. Number in parenthesis is percentage

Export of frozen chicken from Thailand

Most Thai exporters of frozen chicken have their own slaughterhouses and processing plants. All exporters are large and medium-sized companies, while small-scale businesses serve primarily the domestic consumers only. There are a total of 71chicken slaughterhouses and processing plants registered with the Department of Industrial Works (record as of March 2003). The majority of chicken slaughterhouses are small-scale firms with a 67.60% share, followed by medium-sized firms with 22.54% share. The large-sized firms constitute only 9.86% of all chicken slaughterhouses. Region wise, 71.83% of Thailand chicken slaughterhouses / processing plants, are located in the central region, followed by 15.50% in the northeastern region. The remaining 7.04% and 5.63% are small-scale businesses located in the north and the south, respectively. (Table 3)

Table 3 Number of chicken processing factories registered to Department of Industrial Works classified by region in 2002

Region	Abattoir/ Slaughter Plant			
	Large	Medium	Small	**Total**
Central	6 (8.45)	15 (21.13)	30 (42.25)	51 (71.83)
Northern	0 (0.00)	0 (0.00)	5 (7.04)	5 (7.04)
Northeastern	1 (1.41)	1 (1.41)	9 (12.68)	11 (15.50)
Southern	0	0	4	4

	(0.00)	(0.00)	(5.63)	(5.63)
Total	7 (9.86)	16 (22.54)	48 (67.60)	71 (100.00)

Source : Department of Industrial Works
Note : Number in parenthesis is percentage

Table 4 Quantity of Thai chicken meat in 1998 – 2002

Unit: thousand tons

Year	Chicken meat Export	Domestic consumption	Total Chicken meat	% Change
1998	264.25 (36.29)	463.94 (63.71)	728.19 (100.00)	-
1999	285.86 (35.95)	509.41 (64.05)	795.27 (100.00)	9.21
2000	322.07 (36.28)	565.59 (63.72)	887.66 (100.00)	11.62
2001	413.08 (45.54)	494.00 (54.46)	907.08 (100.00)	2.19
2002	431.94 (44.75)	533.38 (55.25)	965.32 (100.00)	6.42
Average	(39.76)	(60.24)	(100.00)	7.36

Sources : International Animal Quarantine Station, Bureau of Disease Control and Veterinary Service ; Calculate
Note :
1. One bird = 1.8 kg
2. One ton of live broilers = 523 kg of chicken meat
3. Number in parenthesis is percentage

In chicken processing, a full-grown chicken will yield 52% of meat in weight (Department of Industrial Works, 2001). Chicken meat production in Thailand is a following rising trend with 728.19 thousand tons in 1998 increasing to 965.32 thousand tons in 2002 or at a 7.36% average annual growth rate. Export of chicken meat from Thailand tends to grow with the increased chicken production, from 264.25 thousand tons level in 1998 to 431.94 thousand tons in 2002. In terms of the market, 60.26% of the national chicken meat output is destined to domestic consumption and the rest goes to foreign markets. However, the proportion of domestic consumption to the total production has declined from 63.31% in 1998 to 55.25% in 2002, while the proportion of exports has increased from 36.29% to 44.75% in the corresponding years (Table 4)

The export of Thai chicken is of two types: frozen chicken meat and cooked chicken meat. The first type constitutes larger export share 70.37% in 2002 a drop from 77.43% level in 1998, while the export share of the second type is on the increase from 22.57% in 1998 to 29.63% in 2002. The overall export volume tends to increase notably from 264.25 thousand tons in 1998 to 431.94 thousand tons in 2002, or at a 13.42% annual growth rate. Correspondingly, the export value of chicken meat increased from 24,323.19 million baht in 1998 to 38,316.19 million baht or approximately U$ 934.54 million (1 U$ = 41 bath) in 2002 or at 14.69% average annual growth rate (Table 5). Exports of Thai chicken meat can generate substantial foreign earning and the income figure tends to grow continually. As a consequence, the frozen chicken industry in Thailand should receive greater support and attention from the government sector while the private sector should contribute to this industrial development by paying attention to food safety, food quality standard, and the environmentally – friendly production process.

Table 5 The export of chicken meat in 1998 - 2002

Year	Frozen chicken meat		Cooked chicken meat		Total chicken meat		% Change	
	Volume (tons)	Value (million baht)	Volume (tons)	Value (million baht)	Volume (tons)	Value (million baht)	Volume	Value
1998	204.60 (77.43)	16,538.00 (68.00)	59.65 (22.57)	7,784.19 (32.00)	264.25 (100.00)	24,322.19 (100.00)	-	-
1999	220.79 (77.24)	16,273.00 (67.91)	65.07 (22.76)	7,689.44 (32.09)	285.86 (100.00)	23,962.44 (100.00)	8.18	-1.48
2000	233.49 (72.50)	15,822.00 (63.19)	88.58 (27.50)	9,218.08 (36.81)	322.07 (100.00)	25,040.08 (100.00)	12.67	4.50
2001	296.43 (71.76)	24,592.00 (61.29)	116.65 (28.24)	15,533.54 (38.71)	413.08 (100.00)	40,125.54 (100.00)	28.26	60.25
2002	303.97 (70.37)	22,591.00 (58.96)	127.97 (29.63)	15,725.19 (41.04)	431.94 (100.00)	38,316.19 (100.00)	4.57	-4.51
Average	(73.86)	(63.87)	(26.14)	(36.13)	-	-	**13.42**	**14.69**

Source : International Animal Quarantine Station, Bureau of Disease Control and Veterinary Service, Department of Livestock Development (Thailand)
Note: Number in parenthesis is percentage

By extent of export to various countries, Japan has been the largest importer of Thai frozen chicken, accounting for 55.89% of export share in 2002 and 55.98% in 2002. The next major importer is Germany, with export share of 13.20% in 2000 and 11.59% in 2002: This is followed by the Netherlands with export share of 7.71% in 2000 and 5.78% in 2002. The reason for the recent decrease in export share to EU countries is that certain chemical residues were found in chicken meat from Thailand and as a result EU countries have become more strict about importing frozen chicken meat from Thailand. However, the overall export figures of Thai frozen chicken meat remain growing, from 296,425 tons in 2001 to 303,966 tons in 2002. Other importing markets are also growing slightly in terms of export share, from 19.4% in 2002 to 20.32% in 2002. The trend of export growth continues to be positive with the rate of 2.54% in 2002 (Table 6)

Table 6 Countries importing Thai frozen chicken in 2000 – 2002

Import country	Year					
	2000		2001		2002	
	Volume (tons)	Value (million baht)	Volume (tons)	Value (million baht)	Volume (tons)	Value (million baht)
Japan	130,504 (55.89)	8,889 (56.18)	147,785 (49.86)	11,665 (47.43)	170,171 (55.98)	13,697 (60.63)

Malaysia	2,732 (1.17)	147 (0.93)	9,999 (3.37)	753 (3.06)	9,016 (2.97)	695 (3.08)
China	5,918 (2.54)	141 (0.89)	4,170 (1.41)	296 (1.20)	10,209 (3.36)	300 (1.33)
Germany	30,825 (13.20)	2,328 (14.71)	45,537 (15.36)	4,872 (19.81)	35,230 (11.59)	2,597 (11.50)
Netherlands	18,003 (7.71)	1,362 (8.61)	21,885 (7.38)	2,186 (8.89)	17,570 (5.78)	1,308 (5.79)
Others	45,508 (19.49)	2,956 (18.68)	67,050 (22.62)	4,819 (19.60)	61,770 (20.32)	3,994 (17.68)
Total	233,491 (100.00)	15,822 (100.00)	296,425 (100.00)	24,592 (100.00)	303,966 (100.00)	22,591 (100.00)
% change	-	-	26.95	55.43	2.54	-8.14

Source : Information and Statistics Group, Information Technology Center, Department of Livestock Development (Thailand)

Note : Number in parenthesis is percentage

Chicken meat export in the world market

In 2002, the USA was the world's largest exporter of chicken meat with 2.2 million tons

Table 7 Quantity of chicken meat world export in 2001 - 2002

Unit: tons

Country	Year		% Market share in 2002
	2001	2002(P)	
United State	2,521,000	2,208,000	41.26
Brazil	1,241,000	1,425,000	26.63
European Union	718,000	670,000	12.52
Thailand *	413,080	431,940	8.07
China (PRC)	489,000	400,000	7.48
Canada	69,000	75,000	1.40
Hungary	35,000	32,000	0.60
Others	109,000	109,000	2.04
Total	5,595,080	5,350,940	100.00

Source: 1. FAS post reports, official statistics, and inter-agency analysis (p) preliminary
* Department of Livestock Development (Thailand)

volume and 44.49% market share, followed by Brazil with 1.4 million tons and 23.84% market share. Thailand was the fourth leading exporter in the same year with 431.9 thousand tons export volume and 7.82% world market share. Among the Asian exporters of chicken meat, Thailand is the largest followed by China (Table 7)

Case Studies

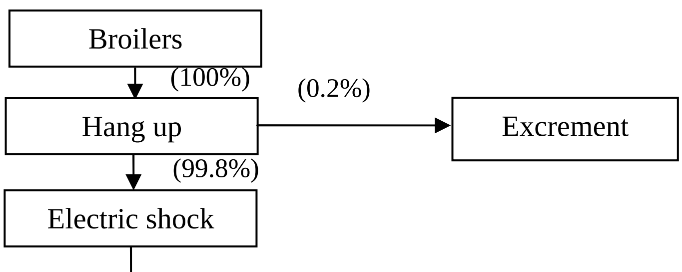
Seven frozen chicken meat exporting companies were selected for case study, four being large-sized businesses and three medium-sized, based on the following criteria:-

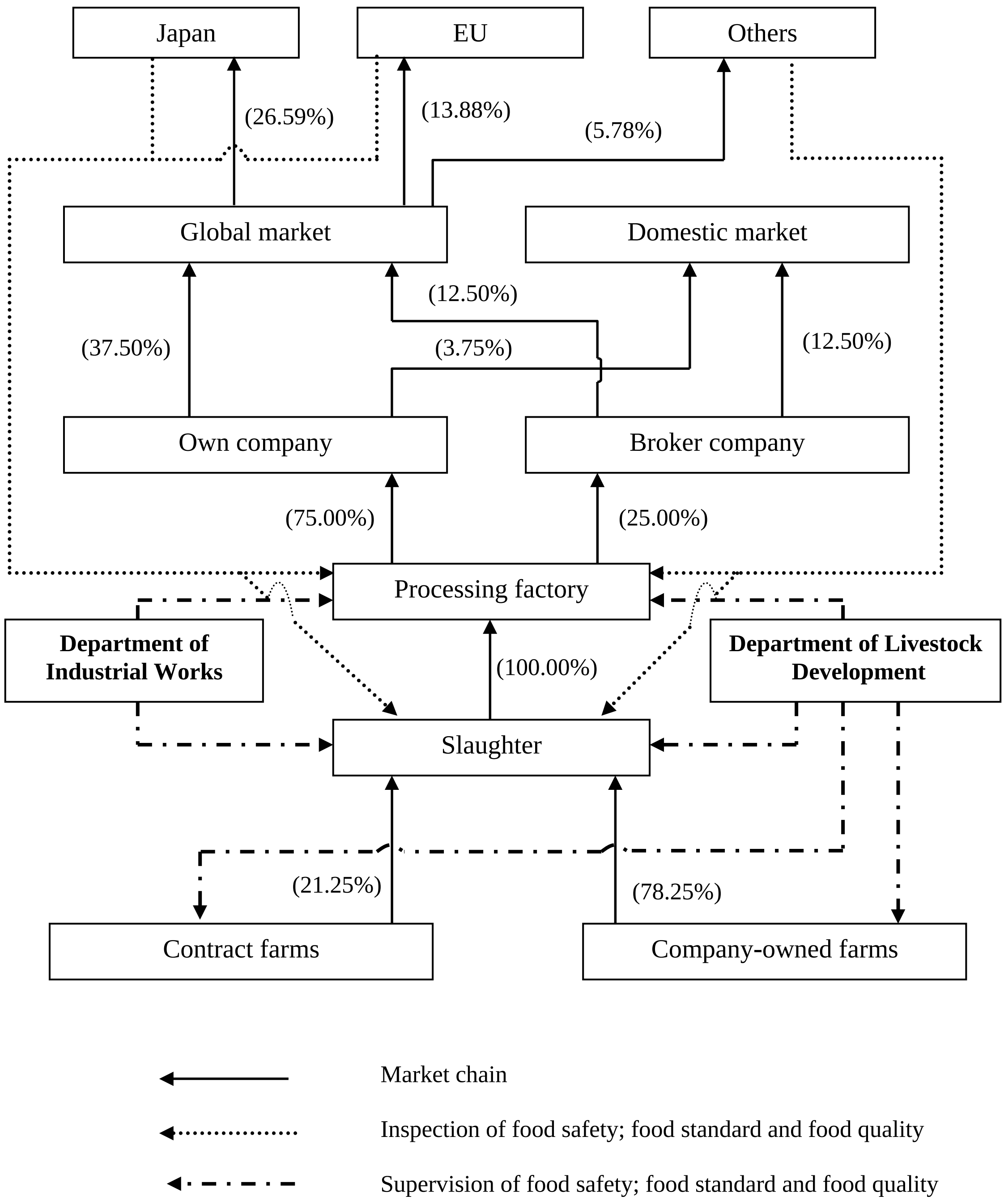
1) All large-sized companies are located in Bangkok and its periphery, two with more than 10 year in establishment and the other two with 25-35 years in establishment. They all have their own slaughterhouses and processing plants, are located outside the industrial estate but in the neighborhood of a town community. Except for one company they all receive no support from BOI but have used their own funds for investments worth more than 200 million baht in each case.

2) All medium-sized companies are also located in Bangkok and its periphery, with 20-26 years in establishment. They all have their own slaughterhouses and processing plants, are located outside of the industrial estate zone but in the neighborhood of a town community. None of these companies have received support from BOI but used their own funds for investment at 50-200 million baht in each case.

1. Production and marketing

The large-sized companies have their production capacity in terms of raw materials (live chicken) approximately 151,250 chickens per day to produce 156 tons of frozen chicken meat. The remaining fresh chicken meat's for domestic consumption, the major market. The average work time is 13 hours per day and 27 days per month. These companies have on average 1,168 permanent employees and 2,270 causal hires or daily workers (Table 8). Their raw materials mostly come from local provincial areas and other provincial areas within a 100 kilometer distance. However, two companies have some of their raw materials supplied from sources in other provinces more than 100 kilometers away. Specifically, raw materials can be from two main sources: the company's own farm, with 55-100%; and contract farmers, with about 20-45%. One company gets all raw materials from its own farm. To ensure the control of meat quality to meet standards and to be free from any chemical residues, all raw materials will never come from the supply of individual farmers or farmer's representatives. In terms of the marketing of these companies, 46.25% of total output will be frozen chicken meat for export, and the majority, 53.75%, will be sold as fresh meat domestically. Most large-sized companies namely three export their products 100% under their own brand name. Only one company exports all its products through trading agent. Within the domestic market, 75% of output is marketed by the companies themselves and the remaining 25% through trading agents. The major importer of frozen chicken meat from these companies is Japan, accounting for 57.5% of their total export share, while EU countries import on the average 30% of their export, and other countries have 12.50% export market share (Table 9-10). The production process of these companies is illustrated in Figure 1. The market chain and checking of broiler meat in large size company of Thailand is illustrated in Figure 2.





Source: Survey

Figure: 2 Market chain and checking of broiler meat in large size company of Thailand

Table 8 Capacity productions of a large size frozen chicken export company

Company	Capacity (birds/day)	Frozen chicken (tons/day)	Time work		Amount of labor (man)	
			(hr/day)	(day/month)	Permanent	dairy
A	185,000	200	16	25	3,500	-
B	90,000	80	9	30	520	2,080
C	90,000	165	10	26	300	2,000
D	240,000	180	16	26	350	5,000
Average	11,250	156	13	27	1,168	2,270

Source: Survey

Table 9 Percentage of frozen chicken meat exported of a large size company

Company	% of domestic	% of export	% of export by country		
			Japan	EU	Others
A	30	70	45.00	30.00	25.00
B	60	40	55.00	40.00	5.00
C	60	40	60.00	30.00	10.00
D	55	35	70.00	20.00	10.00
Average	53.75	46.25	57.50	30.00	12.50
% of total	53.75	46.25	26.59	13.88	5.78

Source: Survey

Table 10 Percentage of frozen chicken meat and fresh chicken meat distribution of a large size company

Company	% of export		% of domestic	
	Own company	Broker company	Own company	Broker company
A	100.00	-	70.00	30.00
B	100.00	-	100.00	-
C	100.00	-	100.00	-
D	-	100.00	30.00	70.00
Average	75.00	25.00	75.00	25.00

% of total	32.50	12.50	32.50	12.50

Source: Survey

The medium-sized companies have a total production capacity of 65,000 live-chickens as raw materials to produce about 46 tons daily of frozen meat and the remaining is fresh chicken meat for domestic market. The working times are eight hours per day and 26 days a month. They have on average 72 permanent employees and 1,249 daily wage laborers (Table 11). The raw materials mostly come fro the local provincial area and the neighboring provinces within a 100 kilometer distance. Specifically, there are two sources of raw materials, namely the companies' own farms (about 60-100%) and contract farmers (about 30-40%). Only one company in this production scale uses 100% of raw materials from its own farm. Similar to the large-sized companies, the medium-sized firms do not depend on general farmers or farmer's representatives for raw materials in producing frozen chicken meat to avoid the problems of meat quality standards and chemical residues. On market orientation, these companies export only 36.67% of their total frozen chicken meat output, relatively less than the figure of large-sized companies. The rest, 63.33% of their output is the fresh chicken meat sold to domestic market, a larger proportion compared to the large-sized companies. Only one of the medium-sized companies exports 100% of their products on its own name. However, the proportion of export through trading agents is only 8.33% relatively small compared to the large-sized companies. Within the domestic market, medium-sized companies handle 100% of their marketing. The major importer of their frozen chicken meat is also Japan, accounting for 51.67% of all export, followed by EU market which buys about 30%, and the remaining 18.33% is absorbed by other countries (Table12-13). The market chain and checking of broiler meat in large size company of Thailand is illustrated in Figure 3.

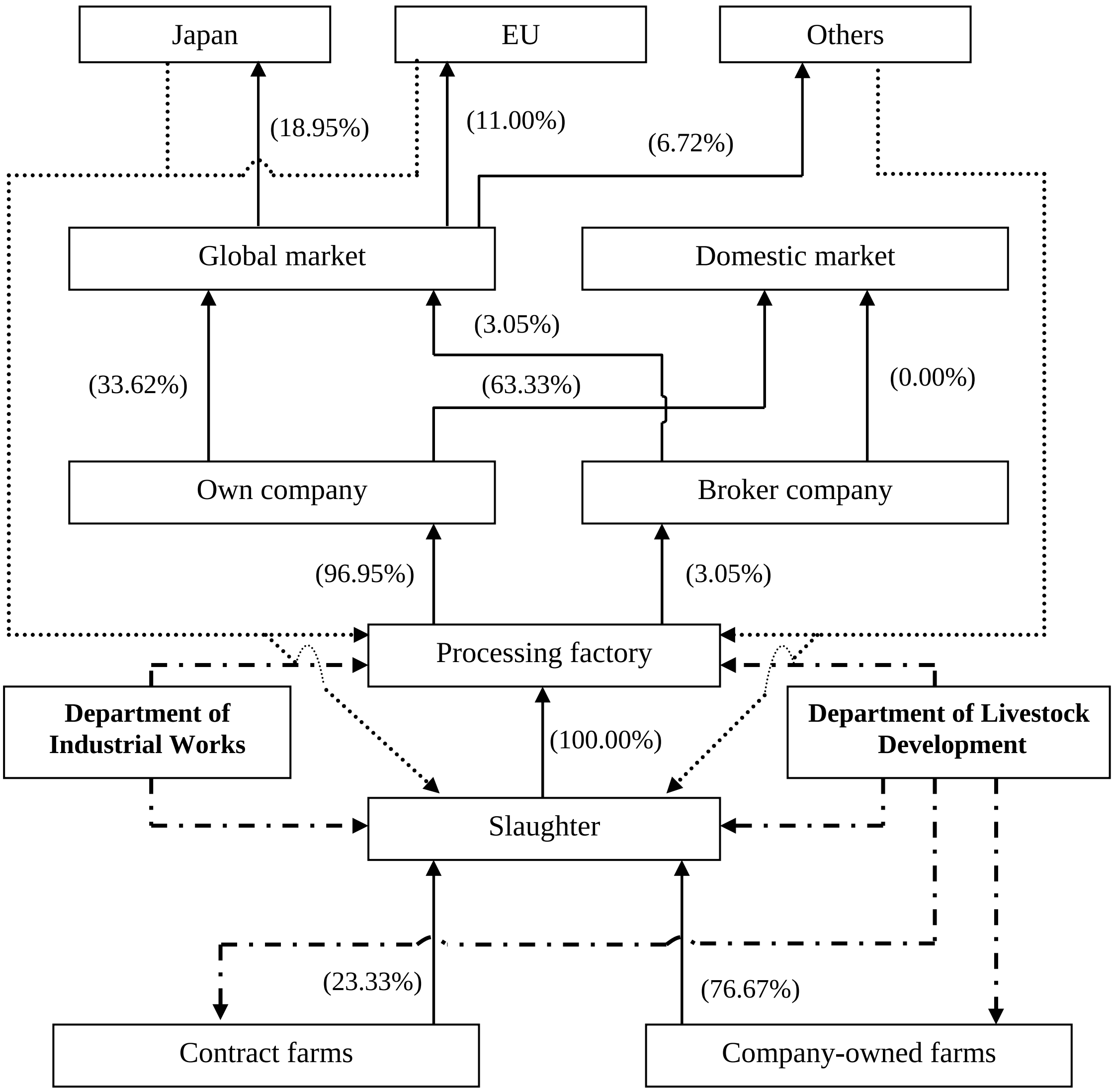


Table 11 Capacity productions of a medium size frozen chicken export company

Company	Capacity (birds/day)	Frozen chicken (tons/day)	Time work		Amount of labor (man)	
			(hr/day)	(day/month)	Permanent	Dairy
E	70,000	45	8	25	80	1,500
F	75,000	58	8	26	59	1,200
G	50,000	35	8	26	78	1,047
Average	65,000	46	8	25.67	72.33	1,249

Source: Survey

Table 12 Percentage of frozen chicken meat exported of a medium size company

Company	% of domestic	% of export	% of export by country		
			Japan	EU	Others
E	65	35	45.00	35.00	20.00
F	60	40	60.00	25.00	15.00
G	65	35	50.00	30.00	20.00
Average	63.33	36.67	51.67	30.00	18.33
% of total	63.33	36.67	18.95	11.00	6.72

Source: Survey

Table 13 Percentage of frozen chicken meat and fresh chicken meat distribution of a medium size company

Company	% of export		% of domestic	
	Own company	Broker company	Own company	Broker company
E	95.00	5.00	100.00	0
F	100.00	0.00	100.00	0
G	80.00	20.00	100.00	0
Average	91.67	8.33	100.00	0
% of total	33.62	3.05	63.33	0

Source: Survey

2. Environmental management

Both large and medium-sized companies in the frozen chicken meat industry have established their own environmental policies including energy conservation, quality management, safety food products, safety in workplace, water conservation, industrial waste reduction, and disposal management of wastes and pollutants. The strict adherence to these principles has enabled these companies to be successful in environmental management to certain degrees.

Broilers, the raw materials for frozen chicken meat production in large-sized companies, are subject to close and regular quality control at all stages of production. The companies seek to hire farmers to do supervised farming with most input supplies from the companies: They also provide farmers with various husbandry equipment; The close supervision and control enable the companies to obtain high quality with good standard raw materials; Any raw materials from external source will be from contract farmers that the companies also give supervision to ensure correct farming standards and the strict use of preventive medication programs without the use of prohibitive chemicals. The companies, furthermore, provide consultation of animal healthcare, inform about the implication of chemical residues on livestock marketing, and maintain monitoring of the quality of raw materials. These companies refuse to buy raw materials from independent farmers because they are unsure of quality. Before slaughtering, they also require health examinations of the animals, prevention of stress in the animals, and adherence to other practices demanded by the importers. The slaughtering process also strictly follows the Halal laws of Moslems to enable the export to Islamic countries. The medium-sized companies adopt a similar practice in raw materials procurement and in slaughtering process.

Both large-sized and medium-sized companies employ similar solid waste management methods by commercial utilization of by-products. Feathers are sold to animal feed companies, and the animals' organs, such as the head, and stomach parts are sold to fish farmers as fish food. Consequently, they have no problems about waste elimination. Malodor from production process does not present as well. The good environmental management of these companies, hence, creates no conflict with the neighboring communities. This is one reason for the neighboring communities not to pressure the companies to improve their production process.

On the issue of access to information, the large-sized companies reveal all environmental information to the public while the medium-sized companies do not. For training on environmental problems, the large-sized companies organize once or twice every year while only one of the medium-sized companies does.

For environmental management, both large and medium-sized companies set up responsible unit to regularly monitor the environmental quality. The large-sized companies all have their own wastewater treatment system, two of which use the aeration system and the others an activated sludge process. One medium-size company uses activated sludge process while the others have aeration system. Investment cost for environmental management of large-sized companies is about 10-20 million baht while that of medium-sized companies is about the same level. The investment for this purpose is done according to the policy of their parent companies to create good images and to comply with the laws. Two large sized companies and two medium-sized companies also include environmental records in their financial reports as they excise monitoring activities in every stage of production, namely the regular measurement of BOD levels of the treated wastewater. The two large-sized companies do this daily and once a week; only one does this once a week. In the case of large-sized companies, the treated wastewater has BOD values of 10-25 mg/l, suspended solids (SS) values of 10-47 mg/l and pH values of 7-8.5 level. The medium-sized companies have average BOD values of 5-30 mg/l, SS values of 15-49 mg/l and pH values of 6.5-8.5, which are better than the minimum standards required by the Department of Industrial Works (BOD values is 4.1-49.4 mg/l, SS values is 8-50 mg/l and pH values is < 9). Apart from the companies own measures, the Department of Industrial Works under the Ministry of Industry also undertake environmental quality inspection at the plants, 1-4 times a month.

Specifically, there are also external inspection processes conducted by major importing firms from Japan, EU countries and other countries which visit these company factories 1-3 times a year to check the quality and standards of chicken meat products. Furthermore, Thailand's Livestock of Department Development has assigned veterinarians to station at the slaughterhouses to inspect for meat quality and standards before the issuance of certification for quality of the products which will be exported. Thus, the quality and standards of Thai frozen chicken meat in the world market can be guaranteed.

The careful environmental management in the slaughterhouses and processing plants of large-sized companies are considered to create many benefits to the companies themselves. They can compete with other exporters in the world market by supplying products of international standards; they can respond well to the demanded of customers and consumers in global markets; and can create good relationship with neighboring communities and the public at large. In addition, by doing so these companies gain a good image, a better relationships with the government sector, and a greater market share while saving expenses, energy and raw material. The medium-sized companies perceive that once they implement good environmental management, their products can be of international standards to gain competitiveness in the world market, and they can create good relationship between government and private sector. It is apparent that medium-sized companies have a narrower perspective than their counterpart in terms of benefits from good environmental management.

The frozen chicken meat and other products turned out by both large and medium sized companies are guaranteed for safety, quality standards, and the absence of contaminants because the production processes have been approved for both GMP and HACCP systems. In terms of ISO, all large-sized companies are certified for ISO 9000, with one also obtaining ISO 14000. No medium-sized companies have been certified for ISO yet.

3. Factors affecting the need for environmental quality management in the frozen chicken meat industry

On the question of what factors have driven the frozen chicken meat enterprises to improve the production process into a more environmental-friendly and more efficient nature, the seven companies under study provided diverse opinions. (1) For the most important factor, one large-sized company and two medium-sized companies considered it to be pressure from importers; one large-sized company and one medium-sized company listed the requirement of the parent company, the company's environmental awareness, and the enforcement of state laws. (2) For the second most important factor, two large-sized companies and one medium-sized company mentioned the enforcement of state laws; one company in each category said the company's own environmental awareness; one large-sized company considered to be the requirement of the parent company; and one medium-sized company took it to be the pressure from importers. (3) For the third most important factor, one company from each category mentioned the pressure from the Frozen Chicken Meat Exporters' Association; one large-sized company listed the enforcement of state laws, the company's own environmental awareness, and implementation according to the requirement of the parent company.

4. The roles of the government sector in the frozen chicken meat industry

Prior to the promulgation of the 1997 Constitution of the Kingdom of Thailand, the policy measures and laws for solving environmental problems were primarily in control and command approach. However, under the new Constitution, the decision-making and legal frameworks for environmental issues become decentralized. Civic communities, local administration organizations, business enterprises, lay people and the government sector as provided by the constitution, are partners in the protection and conservation of the environment, and in dealing with various environmental problems in the nature of sustainable development (Boramanant and Kraisorapong, 2001). There are a number of governmental agencies involved in the environmental issues pertinent to the frozen chicken meat industry.

For food safety and standards, the Department of Livestock Development under the Ministry of Agriculture and Cooperative is the direct responsible agency to ensure the proper management from the stage of raw materials production to the stage of processing into food products. This Department's main duties and responsibilities are: (1) implementation of the laws addressing animal epidemics, animal diseases control, and animal genetic improvement; (2) production and procurement of biological materials and medical supplies to prevent elimination of animal diseases; (3) implementation of program for breed improvement and multiplication, animal health cares animal medication, and processing of meat products; (4) promotion of farming of economically significant livestock; (5) control of meat quality, meat products, and other animal outputs to meet international standards (Duty and Responsibility of the Department of Livestock Development, 2003: Online). The Department has offices at the district and provincial levels that can work closely with the poultry farmers by giving assistance and supervision concerning the use of medicines and prohibited substances in animals, epidemic control, establishment of a standard farming system, advice for solving farming problems, and slaughtering, as well as processing processes. It also controls the standards of slaughterhouses and processing plants. In the case of all large and medium-sized companies that export chicken meat and products, it will assign veterinarians to station at the factories to control and inspect that the chicken meat is safe for consumption, contains no residue, and meets food standards. Then the veterinarians are authorized to issue food safety certificates for meat and products that will be exported.

For factory environmental management, the Department of Industrial Factory under the ministry of Industry has the responsibility. It recognizes the utmost importance of industrial environmental management and has taught the livestock slaughtering and processing plants' operators to realize and understand the right ways for environmental management. It regularly organizes activities to encourage the livestock slaughtering and processing sector to minimize industrial pollution and reduce environmental problems. One of its main activities is promoting the development of efficient environmental management systems. It also encourages the application of cleaner technologies, and supports the prudent and practical use of resources and pollution control measures. The Department also performs a routine test of water quality.

5. The roles of NGO's in frozen chicken meat industry

At present, there are more than 300 NGO's (both registered and not registered) in Thailand. NGO's have played important roles in social development in this country for over three decades. So far they have been subject to the suspicion that they are agents creating dissension and conflict in the society, who get money from abroad to wreck the national security, receive money to instigate mobs, and do demonstration work to obstruct national development and to protest against development projects of the government. The image of NGO's in the perception of the general public may be quite negative, as they are partially viewed from outside and judged from their activities. In fact, NGO's are the group of people working for the realization of a better society, and for the government operation and policies to be cross-checked and accessible in terms of information, on the principle of people's participation in development (Who are NGO's, 2003: Online). There are a number of environmental NGO's in Thailand. One example is The Thai Environment Institute which has established the Energy Industry and Environment Program (EIP) to undertake in-depth study and research into appropriate techniques for solving environmental problems (EIP, 2003: Online); and it will provide information access to all involved and interested parties, including the government sector, business sector and the general public for participation in solving environmental problems.

So far, no Environmental NGOs have started a movement against the operations of the frozen chicken meat export industry. This is because the large and medium-sized companies that aim to the export market in particular have maintained strict environmental management in their slaughtering and processing plants according to the Thai laws, and have met the requirement of importing countries' laws. They further respond to additional requirements of the importers. Because of the well-founded industrial environmental management system and the nature of slaughtering and processing procedures in these frozen chicken meat companies, there arises no pollution impact on the neighboring communities. Therefore, in this case, there is no reason for any NGO's to take a movement to pressure for more environmentally-friendly production. Most NGO's in Thailand would pursue only hot and serious issues.

6. The roles of businesses and farm associations in the frozen chicken meat industry

The associations involved with poultry farmers are the Broiler Breeder Association and the Poultry Promotion Association of Thailand under the Patronage of His Majesty the King. They assist the farmers by providing them with information concerning markets and production situations both within and outside of the country. They also help their members to solve relevant problems coordinating with government and private sectors, and help plan boiler production to meet the needs of the market (Dissector of Broiler Association of Thailand, interview: 2003). These two associations disseminate know ledge and information through newsletters and journals.

The Broiler Processing Exporters Association was established in 1991 to act as a regulating and service agency for the large number of Thai chicken meat producers and exporters. Thai Broiler Processing Exporters Association aims to promote the poultry industry, in particular the export market. All activities are mainly to provide information needed for production and marketing, and to cooperate with the Thai government to resolve all problems and constraints to the industry (Association profiles, 2003: Online). It provides information to its members and to the general public through its own website (http://www.thaichickenandduck.com).

7. The requirements of the frozen chicken industry

The results from the interviews with the entrepreneurs in the frozen chicken industry, which involve large-sized and medium-sized entrepreneurs, reveal that this industry still needs some help and support from both related associations and government agencies. Their roles dealing with this industry are as follows:

(1) The related associations can support these entrepreneurs several ways. They should have more involvement and coordination with government agencies in order to solve export problems. Participation in proposing regulations and laws relating standards of production those are relevant to international standards. Cooperation with the government to deal with the negotiations with import countries, which set high standards, in order to adjust their standards. Moreover they should provide seminars on the topic of the new laws and regulations of import countries involving new technology to the association’s members.

(2) If they work more efficiently government agencies can support this industry directly by increasing their budget and recruitment staff in relevant departments such as Department of Livestock Development and Department of Industrial Works. The government should seek new international markets, establish an agency to control the supply of chicken in order to be consistent with the domestic and international demand for chicken; cut down imported feed tax and other components tax; from an agency to take the responsibility of proposing and inspecting regulations and laws which are consistent with the importing countries. Moreover, these information should be distributed to farmers and relevant persons in this industry. The training should also be provided so that farmers, government staff, producers, and other in this industry can cope with the changes and make neccesary adjustments. The information center for the frozen chicken industry should be established to collect and analyse data efficiently.

8. Conclusion

Thailand is the fourth largest exporter of frozen chicken meat and chicken meat products in the world market. The major importer is Japan, followed by the EU market. It is the largest exporter within the Asian region, followed by the People’s Republic of China. Since the importers of frozen chicken meat and chicken meat products in the global market demand that the exporters supply only products that are safe for consumption, contaminant-free, have quality standards, and are processed in an environmentally-friendly nature. In Thailand, as the world’s fourth largest exporter, many adjustments have been made in response to such demand on the part of related sectors. The industry, businesses, government, associations and institutes should continue to seriously deal with the problems as summarized below.

Production at farm level is closely controlled and monitored by both large and medium-sized companies. The farms are also supervised and assisted by the Department of Livestock Development in terms of product safety from the medicines and chemicals used in animal husbandry, of standard farming management to ensure that safety and quality standards are being met, and of GMP application for raw materials that will enter the slaughtering and processing procedures.

The production processes within the plants of every company are also subject to close control and monitoring at all stages and are certified for application of the HACCP system that ensures the safety and quality standards of the end products. Furthermore, there is also an official inspection procedure. The Department of Livestock Development assigns a veterinarian to each company to perform the test and inspection before issuing the certificate for quality and safety standards of the frozen chicken meat and chicken meat products for export. Importers also want to verify the facts. They send representatives to visit and inspect the slaughterhouses and processing plants 1-3 times a year.

For environmental management, seven companies have clear division of responsible and supervisory tasks. All large–sized companies have ISO 9000 certification and one of them also has ISO 14000. Meanwhile, no medium–sized company has yet to reserve the ISO certification. Nevertheless, all companies under study have installed their own wastewater treatment systems that meet the standard of the factory department. All companies also excellently handle their solid wastes by selling the processing by–products to fish farms and animal feed manufacturers. The Department of Industrial Works has the position to give advice, assistance, and inspection involving various environmental aspects, as well as to promote the use of cleaner technology. In fact, all the companies keep acquiring modern technology and at least one large–sized company imported a modern eviscerator from the Netherlands. Generally, large–sized companies perform better in environment management compared to their medium–sized counterparts.

The most important factor driving these companies to gain more environmental awareness and to improve their production processes environmentally are considered to be the pressure from the importers, the enforcement of state laws, the company's own consciousness, and the requirements/policies of the parent company.

It can be concluded that the frozen chicken meat industry in Thailand has tried to develop and improve the production process in response to the demand of importers in the global market, and is able to turn out products with acceptable safety and quality standards for the importing countries. Many have contributed and cooperated to create this improvement within industry. These include the poultry raisers' slaughterhouse and processing plant operations, the Poultry Farmers Association of Thailand and the Foreign Chicken Meat Exporters' Association which have supplied useful information to the cause. Also, the Department of Livestock Development has played a supportive and regulating role from the stages of raw material production to exporting, and the Department of Industrial Works which provides technical support and advice, as well as inspecting the production facilities to ensure efficient and correct environmental management.

9. Suggestion

(1) In order to set practical policy for this industry, the information center for gathering data and analysis of the chicken industry should be established through the cooperation of government agencies and the individual sector.

(2) The government should grant appropriate budgets and staff to improve agencies that work with frozen chicken industry.

(3) The government should cut down feed tax or other raw material taxes.

(4) The government and associations should establish an agency to deal with negotiation and to review regulations and laws to ensure that they are consistent with those of the import countries. Moreover, negotiation involving protection of benefits from this industry should be considered. Meanwhile, the information should be distributed to farmers and relevant persons in order to solve the problem efficiently.

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