Status and constraints of costly port rejection : a case from the Vietnamese frozen seafood export industry

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Status and Constraints of Costly Port Rejection: A Case from the Vietnamese Frozen Seafood Export Industry*

Aya Suzuki† and Vu Hoang Nam‡

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Abstract

While the rising exports have been the source of growth for many developing countries in recent years, the rate of commodities rejected at the ports of developed countries has also been high. Yet why it has remained so despite the costs involved is mostly unknown. This paper takes a case of the frozen seafood export industry in Vietnam and examines the current status of port rejection, roles played by various stakeholders along the value chains, and the constraints faced by the Vietnamese producers and exporters. It concludes with some policy implications, including strengthening the enforcement mechanism of standards compliance particularly at the upstream of the value chain and providing public testing labs for small-scale producers.

Keywords: Port rejection, quality standards, Vietnam, export

JEL classification: F63, L15, O19

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† Lecturer, Department of International Studies, Graduate School of Frontier Sciences, the University of Tokyo (ayaszk@k.u-tokyo.ac.jp) ‡ Professor of Economics, Foreign Trade University (hoangnamftu@yahoo.com)

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INSTITUTE OF DEVELOPING ECONOMIES (IDE), JETRO
3-2-2, WAKABA, MIHAMA-KU, CHIBA-SHI
CHIBA 261-8545, JAPAN

1. Introduction

With the liberalization of market in 1990, Vietnam has expanded the volumes of export and it is ranked as the fourth largest exporter of seafood in the world in 2010 (FAO 2012). Vietnam exports to as many as 153 countries, including very high-end markets in developed countries.

However, the rate of rejected products at ports of EU and US as observed in the "*Meeting Standards, Winning Markets*" (UNIDO 2010) for this sector is also quite high. The report uses three indicators to describe the situation of incompliance, which are: 1) average number of rejections, 2) unit rejection rate, which is the number of rejection per US$1 million of exports, and 3) relative rejection rate, which is the ratio of country share of total rejections to the share of total imports (p22, UNIDO 2010). Measured in three different methods, Vietnam fish and fishery sector is included as one of the lowest-performing countries in all the indicators. The reasons for rejection include: microbiological contaminants, veterinary drug residues, labeling, unsanitary, etc. Analyzing the Japanese port rejection data also reveal the same trend (see Table 1). At the Japanese ports, Vietnam seafood imports have been the major target of intensive inspection in the recent years. Considering that this port rejection data is only a small part of the whole rejection that happens along the value chain, the total amount of seafood products that do not meet the international standard must be quite high.

What is unclear is why this is the case. With 37 years of export experience, Vietnam is no longer an amateur in this field. The port rejection is costly, not only due to the physical costs of the unsold products and the shipment back to the country, but also because it hurts the reputation of the country as an exporter. With increasing global competition and high standards, maintaining the good reputation is critical to attract the consumers' demand. Why have the Vietnamese exporters not been able to reduce the rejection rate? What are the bottlenecks? Along the value chain of fish and fishery products, various stakeholders exist from raising fish seed to processing fish at factory to export. What are the measures taken at each stage to comply with these standards? What should be done to improve the situation and who should be responsible?

Another unclear aspect is that with the increase of stringent international standards and increasing number of certifications, who are hurt the most along the value chain.

Complying with the standards requires improvement in quality management system. Who are to bear those costs? What are the effects on various stakeholders along the value chain? Are there differences in the effects of these impacts depending on the product or characteristics of the value chains?

This paper examines these questions in details for the case of frozen seafood export sector of Vietnam. Vietnam was chosen as a case study because of her fast-growing and changing economy and the fact that it has a high incidence of port rejection at many ports. In particular we pick up two sectors, shrimp and pangasius (catfish) export industries since these are the major exporting products, dominating 39.8% and 30.1% of the Vietnam's seafood export value in 2011 respectively (VASEP 2011). In addition, since they mainly rely on aquaculture, quality management by human plays more important role relative to the case of catches. Although it is a specific case, the process of analyzing the sector is generally applicable to other sectors in other countries.

The next section describes the brief history and the current trend of these industries. The third and fourth sections explain the value chain structures and the brief production processes for pangasius and shrimp sectors, respectively. Section five discusses the food quality standards and certificates required by importing countries and section six describes what measures are taken in Vietnam. Section seven explains the observed effects on stakeholders along the value chains, and section eight discusses major issues and bottlenecks for standards compliances. The final section provides policy implications from this case study.

2. History and Current Trends

2.1 Overview of the Aquaculture Sector in Vietnam

Vietnam has 3,260km coastline and more than 3,000 islands with an area of inland and territorial waters of 226,000km2 and an area of 1 million km2 of Exclusive Economic Zone, which make it favorable natural condition for the development of the aquaculture sector. It has been a long history and tradition in Asia in general and in Vietnam in particular that rice and fish cultivation are on the same plot of land or on adjacent plots. In Vietnam, there is a traditional saying that "rice and fish are like mother and children".

In fact, the aquaculture sector has been considered as one of the prioritized sectors for agricultural diversification, economic development, and poverty reduction in Vietnam. The aquaculture production value in 2010 accounted for more than 35% of the total production value of the whole agriculture, forestry and fisheries sector, which was a large increase from around 16% in 2002. This sector contributed to more than 7% of the GDP in 2010[4] and generates incomes through exports and creates jobs for about three million people, which is about one-twenty fifth of the total population in Vietnam (Tung, Thanh and Phillips 2004).

Mekong River Delta, which is a flat and wide plain located in southern Vietnam, is the main aquaculture production area. The Delta is lying along the last part of the lower section of the Mekong River, which is the world second richest river basin in terms of biodiversity. Before pouring into the East Sea, the Mekong River reaches the Delta with 9 estuaries and a dense canal network. The river's unique interaction with Tonle Sap Lake in Cambodia provides young fish to the delta downstream. According to Baran, Starr and Kura (2007), the Tonle Sap Lake has 23 fish species whose annual migrations are triggered by changes in water levels, and 3 other species triggered by changes in water flows. Every year, flooding comes to this region that brings new organic matter from the upstream. This area contributed more than 41% to the total export value of aquaculture products in the whole country in 2011 (see Figure 1).

2.2 Three Stages in Development

There were three major periods in the development of the aquaculture sector in Vietnam. During the first period from 1957 to 1980, there were few state-owned processing companies in the industry. The first one was Halong Canned Seafood, which was established in 1957 in Northern Vietnam. Later on during this period, 10 more other processing companies were set up in Southern Vietnam. In 1978, the Sea Product Import-Export Corporation (SEPRODEX) was established and had become the largest state-owned seafood processing and exporting company in Vietnam. The second period from 1980 to 1990 has seen the establishment of more than 100 state-owned sea food processing companies that belonged to SEPRODEX all over the country. The third period

[4] This was calculated by author using the data from the General Statistical Office of Vietnam (http://www.gso.gov.vn/default_en.aspx. Accessed in July 2012).

is from 1990 up to now. The economic reform policies (*Doi Moi)* started in 1986 and became effective in the 1990s including trade liberalization, provision of land use rights transferability, and encouragement of the private sector including household enterprises created favorable conditions for production and exports of aquaculture products. The number of seafood processing and exporting enterprises has increased. The private enterprises have been competing with and replacing the state-owned enterprises in processing and exporting aquaculture products.

Growth in Production and Exports

Since then the aquaculture sector has gained remarkable achievements in both production and exports. In the world of aquaculture production, Vietnam ranks the third, after China and India (see Table 2). There has been a substantial growth in aquaculture production in Vietnam. In 1997, the aquaculture production was only 40,000 tons, which is only less than one tenth of that in 2000. In 2010, the production was more than five times that of 2000.

Such increase in production was possible because Vietnam has a growing domestic resource base and only imports a limited amount of inputs for its aquatic production. In 2010, Vietnam had to import only around 150 tons of seafood, which accounted for 5.6% of its total production output (VASEP 2011). From 2000 to 2010, the area for aquaculture production has increased constantly (see Table 3).

Also contributing to the expansion in the production base has been a remarkable increase in the capacity of offshore fishing vessels in Vietnam during the last ten years (see Figure 2). The increase in production led to a remarkable increase in export value of Vietnamese aquatic products (see Figure 3). Since then exports of aquatic products of Vietnam have seen a sharp increase in value. In spite of the slight decrease of value of aquatic export in 2009 due to the global financial crisis, the export value reached a new record in 2010 at more than 5 billion USD.

Over the last years, fishery products become one of the major export products of Vietnam (see Table 4). The export value of fishery products accounted for more than 7%

of the total export value of Vietnam in 2009.[5] Out of the total export value of fishery products, frozen shrimp and frozen fish accounted for nearly 72% in 2009, indicating that shrimp and fish, of which pangasius is the most important product, are two important export products in the aquaculture sector of Vietnam. In fact, there has been a remarkable increase in the export value and export volume of pangasius and export value of shrimp during the last years (see Figure 4). As a result, Vietnam is now among top ten exporters of fish and fishery products and its rank increased quickly from the ninth in 2000 to the forth in 2010 (see Table 5). In 2010, Vietnam was only after China, Norway, and Thailand in exporting fish and fishery products.

Major Destinations

The increase in production was also in parallel with the great diversification of export markets. Export markets have been expanded to more than 150 countries worldwide including major markets such as the EU including Germany, Spain, Italy, the Netherlands, the USA, China, ASEAN, the Eastern Europe in 2011 (see Table 6). Before 2000, Japan had been the largest market. The USA has been becoming a more important market, especially when the Vietnam-US Bilateral Agreement went into force in 2001. In 2002, Vietnam ranked second after Thailand in exporting shrimps to the USA. In the major markets of Vietnamese aquatic products including the EU, the USA, Japan, South Korea, and China and Hong Kong, Vietnam exports mainly shrimps and pangasius (see Table 7)

Regarding the two most important export aquatic products, major countries that were importing shrimps from Vietnam in the first quarter of 2012 are Japan, the USA, the EU, China and Hong Kong, South Korea, Australia, Canada, and Taiwan (VASEP 2012a). Major countries that were importing pangasius of Vietnam in the first 9 months of 2011 are the EU, the USA, Mexico, Brazil, Russia, Australia, Saudi Arabia (see Table 8). The USA used to be the largest importers of the Vietnamese pangasius. Since the application of the anti-dumping tariffs by the USA, the share of pangasius exported to this market in total exported pangasius products has, however, declined substantially, leading to the increasing importance of other markets such as the EU and Russia (see Figure 5).

[5] This was calculated by author using the data from the General Statistical Office of Vietnam (http://www.gso.gov.vn/default_en.aspx. Accessed in July 2012).

Current Challenges

Despite the fast expansion in the past and effective encouragement policies of the Government, the aquatic sector is facing three major bottlenecks: lack of materials; challenges in quality and safety issues; and difficulty in expanding export markets (VASEP 2011). These bottlenecks are caused by various reasons:

- Marine fish stock has been reduced because the coastal area has been overfished with unsustainable fishing methods for many years;
- Catching business has become more difficult resulted from instability in weather conditions and rising fuel price, labor cost, capital cost, and other costs;
- Quality of broodstocks has been downgraded because the selection has not been proper;
- Prices of imported feed and other inputs keep increasing overtime;
- Outbreak of diseases has been more frequent and serious;
- Usage of chemicals, antibiotics, and pesticides are not proper;
- Planning of aquaculture production has not been appropriate;
- Farmers and processors lack management knowledge, information, capital, technology that deter them from expanding their business and improving quality of their products;
- Fish price in the international market has been fluctuating abruptly;
- Various barriers especially non-tariff barriers such as anti-dumping measures (see later sections on details) have been set up in many countries that import Vietnamese aquaculture products; and
- More complicated quality and safety standards have been increasingly applied in developed countries.

2.3 History and Trends of the Pangasius Industry

Production of pangasius dates back to more than 50 year ago and is only in the Mekong River Delta. In fact, Mekong River Delta is the main area of freshwater fish production in Vietnam. The pangasius in Vietnam belong to Genus Pangasius, which include Pangasius Hypoththalmus, Pangasius Bocourti, and several other species that are

called “catfish” in ordinary English (Phillips 2002). Pangasius is mainly grown in freshwater provinces of the Mekong River Delta including An Giang, Dong Thap, Can Tho, and Vinh Long. Before 1975, pangasius used to be domestically consumed and exported to markets such as Hong Kong, Singapore, and Taiwan. It started to be exported to Australia in the mid-1980s and to USA and Europe in the mid-1990s.

Vietnam is the world largest producer of Pangasius, which is low-priced fresh water fish. There are two pangasius pieces in commercial aquaculture in the Mekong River Delta: Pangasius Bocourti or “Basa” in Vietnamese and Pangasius Hypophthalmus or “Tra” in Vietnamese (hereinafter called pangasius). These two pangasius spieces originated from the former farmed in cages in this region a few decades ago. Pangasius Bocourti has a longer production cycle, which is 8 months compared to 6 months of Pangasius Hypophthalmus, requires better water quality, and has a lower dress-out weight, which is amount of fish required to produce one kilo of fillet, than Pangasius Hypophthalmus. In spite of the fact that Pangasius Hypophthalmus is of lower quality than Pangasius Bocourti, the former has gradually replaced the latter and accounted for 95% of pangasius production. The former has been increasingly exported, while the latter is mainly for the local market. In 2002, it was only 72% of Pangasius Hypophthalmus was exported (Young and Son 2002). In 2007, that percentage increased to 90% (VASEP 2009).

In 2011, there were more than 230 pangasius exporters in Vietnam. Vietnamese pangasius was exported to more than 130 countries with the export volume of 600,000 tons and export value of 1.8 billion USD. The major exported product was frozen pangasius fillets (VASEP 2011).

2.4 History and Trends of the Shrimp Industry

Shrimp growing has a longer history than pangasius and dates back about 100 years ago. In fact, brackish water aquaculture in both Southern and Northern Vietnam is dominated by shrimp farming. The Mekong River Delta is the most important region for cultivating aquaculture products in general and shrimp in particular. According to Le (2012), Black Tiger prawn is the major aquaculture product in Vietnam with the culture area of 570,000 hectares covering 94% of the total brackish and marine culture area. In

Vietnam, Mekong River Delta is the most important area accounting for around 80% of the farming area and the same percentage of production of Black Tiger prawn in Vietnam. The white shrimp Panaeus Vannamei was only introduced in 2000.

The production of shrimp, however, only expanded quickly after the 1990s due to the advancement in technology to produce artificial shrimp seed, the openness of the Vietnamese economy and international trade following the *Doi Moi* policy implemented in 1986.[6] The policy of the Government that allows the conversion of rice fields and salt pans into shrimp ponds was considered one of important factors that contributed to the development of this industry.

Shrimp products for exports include block frozen shrimps, canned shrimps, and processed shrimps, of which block frozen shrimps account for the largest proportion of the total export value. The processed shrimps are, however, gradually expected to overtake traditional frozen shrimps in the future. Apart from being exported, shrimps are sold in the domestic markets. Big cities in Vietnam are destinations for fresh and boiled shrimps. In 2011, the export value of Vietnamese shrimps reached a new record of 2.4 billion USD, in which Black Tiger shrimps accounted for 59.7% and white-leg shrimps accounted for 29.3% of the total export value of aquaculture products. Vietnamese shrimps were exported to more than 91 countries (VASEP 2011).

[6] *Doi Moi* or reform policy was officially implemented by the Sixth Party Congress in December 1986 when Vietnam faced an economic crisis and needed policy reforms aimed at reducing macroeconomic instability and accelerating economic growth. The Sixth Party Congress started abolishing the centrally planned economy with a system of bureaucratic centralized management based on state subsidies, and to move to a market-oriented economy with the encouragement of the private sector. More details can be found in Kien and Heo (2008).

Box 1: ***Cases of International Dispute over Vietnamese Pangasius and Shrimps***

As a milestone in the course of its development, the pangasius industry in Vietnam encountered an anti-dumping case in the U.S. market in 2003. Vietnam started exporting pangasius to the USA in 1996 and its market share in 2002 was 2%. Vietnamese pangasius was famous in the U.S. market for its quality, taste, and especially low price, which was only 50% of the U.S. catfish. Because of the competition of the Vietnamese pangasius, the price of the U.S. catfish dropped remarkably such as whole Ictalurus fish from US$1.65 to US$1.25/kg, Ictalurus fillet from US$4.5 to US$3.8/kg (Tung, Thanh and Phillips 2004).

The continuous drop in price initiated aggressive actions from U.S. domestic producers. They first attacked Vietnamese pangasius on environmental and sanitary ground. In 2001, the Catfish Farmers of America (CFA), consisted of producers and agribusiness in six southern states, lobbied for a ban on imports of catfish from Vietnam alleging that Vietnamese catfish was grown in unhygienic conditions in the Mekong River. After the investigating the situation in the Mekong River Delta, the United States Embassy in Vietnam, however, rejected this claim.

The second attack on the Vietnamese pangasius was on the name of catfish. A group of lawmakers in the USA claimed that the Vietnamese pangasius cannot be scientifically called "catfish" and should not be sold under the label of "catfish" in the U.S. market. Vietnamese enterprises had to label their pangasius as "Basa fish" and "Tra fish" to sell to the U.S. market. In spite of this change, exports of the Vietnamese pangasius to the U.S. market continued to increase because the Vietnamese pangasius was already very popular among the U.S. consumers.

The U.S. producers did not stop. In 2002, when the market share of the Vietnamese pangasius was up to 12% in the USA, the CFA and eight catfish processors in the USA alleged that the Vietnamese frozen fish fillets were sold in the USA at the price lower than production cost. The petition was submitted to the International Trade Commission (ITC) under United States Department of Commerce (DOC) and the Vietnam Association of Seafood Exporters and Producers (VASEP) of Vietnam, which represented 56 seafood processors in Vietnam, was requested to be the defendant and submit their arguments for consideration. A delegation of DOC travelled to Vietnam to investigate the situation and finally concluded that Vietnamese pangasius was sold less than fair value in the U.S. market. The case led to import tariffs of 37-64% in the U.S. market, which accounted for 75% of all pangasius exports from Vietnam (Brambilla, Porto and Tarozzi 2007). Shortly after the pangasius exports of Vietnam to the U.S. market have declined by 50% with an estimated loss of about US$24 million. The farm-gate price of pangasius was reduced by half leading to bankruptcies of farmers and great loss of employment (Tung, Thanh and Phillips 2004).

As a result, processing companies and exporters in Vietnam had to diversify their export markets to Europe, Canada, Australia, and later to more than 50 other countries, leading to a substantial growth of the pangasius industry. By late 2003 and in 2004, the price of pangasius has recovered to the level before the case. Farmers reinvested in new cages and ponds and new processors were established. The pangasius industry in Vietnam has emerged as remarkably fast growing aquaculture sector due to the diversification of its export markets following a US anti-dumping case lodged by the Catfish Grower Association of America in 2003.

Right after the anti-dumping case in the pangasius industry, Vietnam faced with a new anti-dumping threat in 2003 for the shrimp products. In December 2003, the Ad Hoc Shrimp Trade Action Committee (ASTAC), which is an association of shrimp farmers in eight southern states of the United States, filed an anti-dumping petition against six countries – Brazil, China, Ecuador, India, Thailand, and Vietnam. The petition alleged that these eight countries had dumped their shrimps in the US market. In January 2004, the DOC announced the anti-dumping investigations against the six countries. Compared with the anti-dumping pangasius case this time VASEP and Vietnamese producers had anticipated the case much earlier and had more time to prepare by having monitored the preparation of the American shrimp producers, analyzed the U.S. shrimp market and the trend of shrimp imports to the U.S., and connected with international trade law firms. Nevertheless, Vietnam could not succeed. In July 2004, The United States International Commission (ITC) decided that there was a reasonable indication that the U.S. industry was materially injured or threatened with injury due to the import of certain shrimp products from those countries. The proposed tariffs were from 12% to 93% on Vietnamese shrimp products. As a result, the Vietnamese producers diversified the export markets to other countries. According to GSO (2012),[7] Japan became the largest market for Vietnamese exported shrimps. In 2009, Japan imported around 40,000 tons of frozen shrimps, which valued more than 360 million USD and accounted for about 20% of the Japanese frozen shrimp market. In 2010, the USA was the second largest importers of Vietnamese frozen shrimps. The USA and Japan imported 28% and 27% of the Vietnamese exported frozen shrimps, respectively. The third and fourth largest markets are the EU and China.

Having not given up the U.S. anti-dumping measures on Vietnamese frozen shrimps, in 2010 Vietnam filed a complaint with the WTO pertaining to the anti-dumping duties that the USA has levied on frozen shrimps from Vietnam. In 2011, a WTO Panel concluded that the method used by the USA to calculate dumping margins were inconsistent with the WTO rules and requested the USA to remove this calculation in the next period of review.[8]

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[7] GSO website: http://www.gso.gov.vn/default_en.aspx. Accessed in July 2012.

[8] For more information on this issue, please see the dispute settlement page by WTO (http://www.wto.org/english/tratop_e/dispu_e/cases_e/ds404_e.htm).

3. Value Chain and Production Process of Pangasius

3.1 Value Chain for Pangasius

Figure 6 describes the value chain of the pangasius with the percentage of value of fish sold to corresponding stakeholders. In the chain, there are suppliers of seed, feed, and veterinary drugs. Producers of seed including larvae and fry (hatcheries) are mainly domestic including both state-owned and private, while suppliers of feed and veterinary are both domestic and foreign producers and traders. The state-owned hatcheries also conduct research on quality of broodstock and aquaculture techniques. Farmers buy these inputs at the market price directly from the suppliers or through traders.

Various farmers exist in the chain to produce fingerlings and fish. While there are mainly independent producers of fingerlings, producers of fish (called "grow-out farmers") can be independent farmers, fishery association, contracted farmers, or farms owned by processors (i.e., vertical integration). In the past, there were only independent grow-out farmers. However, as the standards requirements became stringent, processors find it difficult to control the quality of inputs (fingerlings, feeds) and usage of antibiotics and chemicals on independent farmers, and thus other types of outgrowers emerged. The relationship between the processors and independent farmers is based on informal agreements rather than enforceable contracts. Instead of being independent, farmers can belong to some producer organization (fishery association), from which they receive market information, training on quality management, and technical supports.

Generally, farmers belonging to producer organizations control fish quality better than independent farmers. Contracted farmers are often under closer monitoring of the processors. It is some kind of vertical coordination between the processors and farmers. The processors provide the farmers with different supports and services including guidance on how to use drugs and chemicals and accessibility to laboratory services for fish disease diagnosis. Thus, the quality of fish supplied by the contracted farmers is often of higher quality than the independent farmers. Moreover, an increasing number of processors have been establishing their own farms to ensure the quality and traceability of the fish. The processors apply stringent quality and safety standards to these farms to meet the quality of the Japanese, the U.S., and the EU markets. Recently, due to higher quality and safety standards required by the importers, the number of contracted farmers

and farms owned by the processors has been increasing because the processors find it easier to control the production process of contracted farmers and their own plants to ensure the quality and safety of fish.

For the domestic market, there are local collectors who buy fish from various farmers to sell to wholesalers and retailers in big cities in Vietnam. To the extent that the processors sometimes sell pangasius products that do not meet the export quality standards to the domestic market, the domestic market is a secondary market to the export market. The fish for export are sent to processors for further production before being sent to the overseas markets. In the past, there existed collectors between producers and processors. Due to the increase in the size for producers, processors have been increasingly buying fish directly from farmers. As a result, collectors of exported fish have gradually closed their business and been transformed into transporters, who are hired by processors or farmers to simply transport the fish.

There are various governmental and NGO organizations which are regulating and supporting the main stakeholders in the pangasius chain. Ministry of Agriculture and Rural Development (MARD) is the main governmental body that is responsible for the development the fisheries sector in general and pangasius industry in particular. Under MARD, there are regional departments that provide stakeholders in the pangasius chain with technical and financial supports and extension services. The National Agro-Forestry-Fisheries Quality Assurance Department (NAFIQUAD) under MARD is responsible for matters related to quality of agricultural products including national programs on quality assurance and issuance of quality certificates for agricultural products. Vietnam Association of Seafood Exporters and Producers (VASEP) and Vietnam Fisheries Society (VINAFIS) are associations of processors and exporters of pangasius which are active in promoting the development of the pangasius industry. These bodies are providing producers, collectors, and processors with extension services, credit, technical advice, audit services for certification, market information, organize collective actions, and legal framework for their production activities.

3.2 Production Process of Pangasius

According to various statistics, total production area of pangasius in 2007 was around 5,000-9,000 ha (Mantingh and Nguyen 2008). There are three types of farming sites, in the descending order in terms of importance in pangasius production: ponds (field ponds or island ponds), net-pen enclosures, and floating cages in the river. Field ponds are often less than 5,000 m^2 and about two to three meters deep. Island ponds are on islands in large rivers or on river banks and are often 5,000-10,000 m^2 and up to five meters deep. Each pond requires about two to three workers to take care of feeding the fish and changing 30-50% of water in the pond daily by pumping water from/to canals/rivers. Ponds are often located near canals/rivers. There is no water discharge treatment so that it increases canal/river pollution and disease transmission and outbreaks. After harvest, accumulated waste at the bottom of the pond is removed and released into rivers or used for agriculture fertilization. Nonetheless, the pond aquaculture system is the most productive and environment friendly (Khoi 2011). As a result, pangasius production using ponds has become popular. Various characteristics of these farming sites are presented in Table 9.

In the past, most of pangasius fry were caught from the Mekong River around the border between Cambodia and Vietnam. In the late 1990s, researchers were able to control the whole life cycle of pangasius through breeding. Today, the majority of the fry is produced in hatcheries by the private sector in the Mekong River Delta. First, larvae are nursed to fry until it reaches 1g per piece. The nursing stage from larvae to fry takes 40 days and is the most risky stage because the fry is very sensitive to changes in water quality and temperature and with survival rate of 8-30% (Belton and Little 2008;Sinh and Hien 2010).

From the hatcheries the fry is nursed for around nine weeks to grow to the size of 10-15cm (15g), which are called fingerlings and ready to be sold to farmers (Khoi 2007). The nursing stage from fry to fingerlings takes 80 days with a higher survival rate of 60%. When grow-out farmers purchase fingerlings, their quality is checked by vision by observing their mobility and agility. Healthy fingerlings have bright color and have no body deformation, injury, or damaged fins. At this stage, the quality is not checked by government bodies.

For quality of fingerlings, the most important determinant is quality of broodstocks and the second important one is water quality because it is directly connected with diseases. Nowadays, brooders are selected from grow-out farms who have no breeding program in mind. This has led to significant inbreeding. Quality degradation, which is due to uncontrolled breeding and shortage of seeds and fingerlings, become one of the major problems the sector is currently facing. Before 2003, there was only one spawning season in a year, which was from April to July. After 2003, due to the increase in the demand for pangasius, the spawning has been done throughout the year. As a result, the hatcheries have to use more chemicals and veterinary drugs and give more feed to the female pangasius to make more frequent artificial fertilization possible. Grow-out farmers may suffer because they have no capacity and facility to test the quality of fingerlings. They buy fingerlings mainly based on trust to the hatcheries.

Types of feed also matter for the quality of pangasius. There are two types of feed for pangasius: home-made feed and pallet feed or manufactured feed. Home-made feed is made of rice bran/broken rice, soybeans, and trash fish, and sometimes additives such as vitamin C and lysine are also used (Khoi 2011). It is cheaper than pallet feed and its quality is not consistent. Home-made feed, therefore, can reduce growth of fish and cause high fat deposition in visceral area of the fish. As a result, farmers have shifted from home-made to pallet feed. Until 2002, 99% of farmers still used home-made feed. However, more than 21% of farms, which were often of large scale, used pallet feed (Khiem and others 2010). It approximately takes about 4kg of home-made feed or 2.5-2.8 kg of pallet feed to produce 1kg of pangasius. The fish is fed five to six times a day. In terms of operating cost for producers of fish, the proportion of feed cost is the largest, which is about 74% if home-made feed is used and 90% if manufactured feed is used (Khiem and others 2010), followed by cost of fingerlings and labor cost. Therefore, the survival of fish producers depends heavily on the price of feed. In fact, many farmers decide whether to cultivate pangasius or other types of fish on a crop-by-crop basis () (Khiem and others 2008).

In the past, Pangasius Bocourti was known for its disease resistance. However, because of the rapid expansion of its production has resulted in high stocking densities and water pollution, disease occurrence has been increasing. To deal with the problem,

farmers are using antibiotics for prophylactic therapeutic treatments. Because it would be too costly for farmers if their fish do not meet they buyers' standards and cannot be sold, farmers follow the rules and regulations of quality management strictly. They are, however, rarely aware of what medicines are permitted and not permitted. The small-scale farmers simply follow advices of friends and drug sellers on how to treat disease and use veterinary drugs (Khoi 2011). The fish quality is first decided based on vision checking on color and size and later by testing in the laboratory. The USA and the EU prefer white and pink meet of fish with identical size and are willing to pay higher price for it. Fish that have yellow meat and/or non-identical size can only be sold to the Eastern European markets such as Russia and ASEAN countries. Some of farmers rotate pangasius culture and shrimp culture to avoid such diseases.[9] The culture of fish is all year around. It takes about 6-8 months to raise the fingerlings so that the fish weight can reach around 1-1.5 kg before harvest and being sold to the processors or collectors.

It is often that three weeks before harvest processors or traders will come to farmers to check quality of fish and take a sample of fish they want to buy to test for antibiotic and chemical residuals. For the testing of antibiotics and chemical residuals if residuals exceeding standards are detected, the harvest will be postponed for some time so that the residual content will be reduced over time down to the appropriate level. Before harvest, the fish are starved for two days. The fish is then harvested and transported alive to the processors by boats.

The final price of fish is depended largely on the quality of fish. To know the quality of fish, the collectors/processors will check the color of the fish and take a sample for further testing in their own labs or independent labs. The final price is not set until the day of harvest. In fact, the independent farmers and even the contracted farmers have weak power in negotiating prices with the collectors and/or processors partly because they have no lab to test the quality of fish. Also, there is often delayed payment from the collectors/processors to the farmers.

In processing factories, different fish from different farmers are separated into different batches by the processors. The fish is then checked for quality by sampling,

[9] While it is easy to convert shrimp ponds to rice fields, it is difficult to convert pangasius ponds to rice fields. As a result, the pangasius production maintain a high latent capacity, where farmers produce pangasius when the demand is high and stop the production temporarily when there is reduction in demand.

cleaned, filleted, and frozen for exports. To obtain certification of compliance with HACCP standards, the products are randomly checked and analyzed by NAFIQAD. Major products from pangasius include fillet, dry pangasius, underdone slice skill, shredded and dried fish, canned fish, sausage, stomach, and others. In addition, there are side products for example fat of the pangasius is sold to producers of soap, bones and heads of the pangasius are sold to producers of livestock feed (see Figure 7). Most of the processors apply the quality management systems such as HACCP, ISO 9001:2000, and SQF 2000. Large processors are equipped with advanced equipments and machines and frequently providing their workers with training courses (Khoi 2007).

Over time, the pangasius industry has seen the increase in the number of large farms and the decline in the number of relatively small farms as depicted in Figure 8. It is noted that pangasius production is more capital intensive compared to other aquaculture production so that smaller farmers cannot compete with larger ones. Processors are shifting from smaller farmers to larger ones because the latter can provide them with fish that are of higher quality and meet better standard requirements. However, farmers with less than 0.5ha still accounted for more than 80% of the total farmers in 2008. Because of limited land it is more difficult for small pangasius farmers to grow but relatively easier for them to cultivate other fish species or even downgrade from grow-out farming to nursing or hatching. The farmers that do not have capital to invest in nursing or hatching were then forced to exit the industry.

4. Value Chain and Production Process of Shrimp

4.1 Value Chain for Shrimps

The following figure describes the value chain of the shrimp production in Vietnam (see Figure 9). In this chain, input suppliers include three groups of stakeholders: sellers of inputs such as feed and antibiotics; fishermen that catch shrimp broodstocks from the wild; and shrimp hatchery and nursery farmers. The fishermen sell their broodstocks to the hatchery and nursery farmers directly or through traders. It is noted that some broodstocks are brought from central Vietnam to the Mekong River Delta. According to Le (2012), in 2009 there were 1,100 Black Tiger and five white leg hatcheries in the Mekong River Delta that produced more than 9 billion post larvae of

Black Tiger prawn and 250 million post larvae of white leg prawn, altogether accounting for 50% of the total demand in the region. More than 70% of the Black Tiger post larvae are sold directly to the grow-out farmers in the same province, while about 26% are sold through seed traders and the rest is kept for self-nursing. The hatcheries can have five to six cycles a year. The nursery sites can have about 50 cycles a year, of which one cycle is about three to five days.

Grow-out farmers including improved extensive and intensive/semi-intensive farmers can be independent farmers or contracted farmers, which are invested by the processing companies. According to Le (2012), compared with the intensive farmers the improved extensive farmers often have larger average culture area per farm, lower average stocking density, shorter stocking time, lower percentage of post larvae being tested for diseases, prawn mainly being fed by natural feed, lower survival rate, and importantly lower yield, which is only one seventh of intensive farmers. Intensive and semi-intensive production is mainly applied for growing Vannamei, while extensive production is applied for growing Black Tiger shrimps and whiteleg shrimps. In the Mekong River Delta, about 78% of the area is cultured by the improved extensive farmers and the remaining by the intensive and semi-intensive farmers. Most of these farmers are independent and are small-scale (Tung, Thanh and Phillips 2004).

Prawn trading activities often take place during the peak harvest from April to September. The independent farmers sell their products to collectors and collectors sell the shrimps to wholesale buyers. The collectors and wholesale buyers are sometimes owned by the same people that are suppliers of inputs. The wholesale buyers then sell the shrimps to the processing companies. The relationship between the wholesale buyers and the processing companies is often spot market relationship. The contracted farmers often sell the shrimps directly to the processing companies. They may, however, sell to the collectors and/or wholesale buyers as it is not always possible to enforce the contract between the processing companies and the contracted farmers. According to Loc (2006), about 60% of the shrimps are sold to the processing companies through the collectors and/or wholesale buyers.

For export, the shrimps will be processed, packed, and delivered to distributers, which are foreign import companies. Some of the foreign import companies are located in

Vietnam, mostly in Ho Chi Minh City. These foreign import companies re-label the final products and sell them to foreign retailers, which then finally sell the shrimps to end users. For the domestic market, the shrimps can be sold directly from farmers or from collectors and processors to local markets, supermarkets, and restaurants. In this chain, 83% of shrimps are exported, while only 17% are sold to the domestic market.

Apart from these main stakeholders, there are minor stakeholders including service providers such as feed, medicine, and ice providers, people that process shrimp heads, and local transporters.

Similar to the value chain of pangasius, various governmental and nongovernmental organizations are supporting the major stakeholders in the value chain of shrimp. The MARD and its agencies, of which NAFIQAD is important, VASEP, and national and provincial trade promotion centers, are managing the shrimp industry and providing the suppliers, farmers, and processors with technical advices, extension services, training courses on management, quality control, financial supports, opportunities to take part in domestic and overseas trade fairs. Particularly, VASEP as an effective association of the processors represented the processors in legal matters including the anti-dumping of the European market and provided its processor members with market information and various trainings.

Comparing the market structures for two sectors, while large portions of the catfish and shrimp both go to processors (93% for catfish and 83.6% for shrimp based on the previous figures) and are exported, the value chain structure before the processors is more complicated for shrimps than for catfish. Because of the rising standards, the catfish production is becoming more consolidated (as explained later), and the role of collectors in between the grow-out farmers and the processors is becoming less important. On the other hand, a large portion of shrimps are still being produced by small-scale fish farmers. We will examine the differences in these sectors by carefully analyzing the production processes of these two types of fish products.

4.2 Production Processes of Shrimps

Shrimps can be either caught from the nature or raised in farms. In Vietnam, when exports of shrimp started in 1975, shrimps were mostly caught from the sea. As

the export increased over time, the cultured shrimps have become dominant. Black Tiger and Penaeus Vannamei are the two main types of shrimp cultured in Vietnam.

For cultured shrimps, there are two types of organizing shrimp production, which are called extensive and intensive/semi-intensive. Extensive shrimp production is the traditional organization that is often in the coastal areas and requires minimal investment in labor and management, while intensive shrimp production requires heavy investment in capital and labor. Intensive shrimp production is higher-yielding than extensive production, but it is also prone to the outbreak of diseases due to its high shrimp density. Disease induces the farmers to use antibiotics for cure and that would affect the quality of shrimps. Intensive shrimp production methods are known to have negative effects on the environment because of the intensive use of chemicals. Outbreaks of diseases have been experienced by other shrimp-producing countries, such as Taiwan, Indonesia, and Thailand.

Postlarvaes are produced in hatcheries until it reaches the size of 2-2.5cm and are sold to the farmers. Quality of the postlarvaes is often checked by vision. As a result, shrimp diseases including fungal disease, white spot disease, and monodon baculovirus (MBV) disease are common. To prevent these diseases farmers have to use a great number of antibiotics and chemical substances.

It takes about 4 months for the grow-out farmers to grow the shrimps. The main shrimp crop starts in January and ends in May. Shrimps are often harvested several times in one crop so that harvesting can continue for some months beyond May. Because collectors and/or wholesale buyers collect shrimps from different grow-out farmers and mix them together it is more difficult for the processing companies to trace out the shrimps and ensure its quality than buying shrimps directly from contracted farmers.

Shrimps from the nature are seldom infected with micro-organisms and antibiotics. After being caught, the shrimps are stored on boats offshore on an average of 5 to 7 days (minimum 3 days and maximum 15 days). The shrimps will be sold to the collectors and/or wholesale buyers who will then sell to the processing companies within a day. For various reasons such as inappropriate temperature, hygiene of transportation means, and storage time during the storage offshore and transportation shrimps can be, however, infected with micro-organisms and antibiotics.

5. What are Required by the Importing Countries?

A great number of different food quality standards and certifications are relevant to this sector and the requirements by the importers also vary across countries. Table 10 provides some of the relevant certifications. These are typically requested and required by the importers. Having these certificates by no means guarantee that products procured by these processors would pass the inspection at the port. However, many importers are requiring these as a screening device for capabilities of firms.

Although the focus of these certificates varies, the main concerns for these certifications can be categorized as (a) hygiene, (b) social, and (c) environmental. While early certifications were concerned about what is physically included in the food products (i.e., (a)), more recent certifications tend to include other factors surrounding the production process of the food products, reflecting the awareness of consumers on environment and sustainable livelihood. There are both mandatory and voluntary, public and private standards (For a thorough review on the types of standards, refer to ITC (2011)).

Apart from these certifications, each country has a set of regulations to check the quality of imported goods at ports. The requirements and testing procedures vary greatly across countries, though most includes tests of chemical maximum residue levels. For the EU, while each member country has its own authority conducting the border inspection, the European Food Safety Authority and European Commission Health and Consumer Protection Directorate-General are in charge of assuring food safety at the Union's level. The EU records and shares all the border rejection data on its Rapid Alert System for Food and Feed (RASFF). For US, the Food and Drug Administration (FDA) is in charge of regulating imports based on the Federal Food, Drug and Cosmetic (FD&C) Act (UNIDO 2010). For Japan, the Imported Foods Inspection Services under the Ministry of Health, Labour, and Welfare is in charge of imported food quality regulation based on the Food Safety Basic Act. These port inspections provide other sets of regulations that the exporting countries need to satisfy, as we have seen in Table 1.

Requirements by importers vary greatly across the importing countries, raising the compliance costs for the exporters. According to the interviews to exporters, we can

observe a different pattern of requirements across importing countries. For EU, the main export products are unprocessed fish fillet and shrimps, and the buyers are more concerned about whether the exporters have the relevant certifications, such as SQF, BSC, and GlobalGAP. Thus, from the exporters' point of view, it is most important to obtain the required certifications. It is also similar for the US, except for the difference in the demanded certificates as BAP is more popular among them. As of 2012, there is no requirement by these countries on seafood consignment sampling and testing before clearance for export (VASEP 2012a). On the other hand, the Japanese market presents a different case. The Japanese buyers concerns are not much on whether the exporter is certified, but on the actual levels of antibiotic residues in the products. Although Japanese importers do not value certifications, they care about how production is carried out in practice and often visit processing factories with technical expert and offer technical advices for improvement. Importers conduct sampling tests voluntarily apart from the mandate inspection by the Vietnamese authority (NAFIQAD) because the sampling rate and accuracy of testing is not enough to pass the standards set by the Japanese quarantines. Importers fear the port rejection because the names will be revealed on the website, hurting the reputation of the importers. According to exporters, the port inspection is also very stringent in Japan relative to EU and US.

Furthermore, these quality standards required by importers are not stable but evolve over time, often with "very short notice" as claimed by the exporters.[10] According to the exporters, "Importers require the certificate A today and tomorrow they require the certificate B. As an exporter, there is no alternative but to obtain the B certification as well because otherwise we lose business. At the same time, we also need to pay for renewing the certificate A." According to exporters, recently, Japanese ports are intensifying the inspection of Vietnamese products. These cases are detailed in the Box 2.

Overall, because of the increase in standards, the testing fees and certification fees are increasing for the exporters. The exporters currently incur on average 1.5 to 2 times higher expenditure on testing fees compared to some years back (VASEP 2012a). Also, because it takes more days at the ports of Vietnam for inspection before shipping abroad,

[10] Note that whether this refers to a sudden change in a policy or reflects the lack of policy surveillance capability by importers is not clear.

it adds more expenses for the storage. This increasing number of different certifications and standards is indeed adding costs for the exporters. The application costs for certifications (US$2,000 for initial cost for GlobalGAP) need to be borne by those who will be certified, i.e., stakeholders in Vietnam. For processors and exporters, they incur these costs. For smallholders, the government subsidy is offered in some cases. There are also cases that the testing fees are borne by importers.

Box 2: ***Case of Ethoxyquin for Vietnamese Shrimp***

In May 18, 2012, one shipment to a Japanese port from Vietnam was found to contain Ethoxyquin. Ethoxyquin for shrimp is among those chemicals for which the MRLs are not established, and because Japanese government applies the positive list system, it is applied the uniform maximum residue level of 0.01ppm. According to "the Imported Foods Monitoring Plan for FY 2012," if a violat ion is detected, the rate of monitoring inspection will be increased by 30% and voluntary self-inspection is advised for the violators, whose names are revealed on website. This monitoring inspection will in principle be normalized if no more violation is detected for one year and/or after more than 60 inspections. While this procedure is a regular process for the Japanese quarantine system, Vietnam exporters raised concern because a) the MRL of Ethoxyquin is too low for Japan because the MRL for EU and the US is 150ppm and Japan also applies 150ppm for fishmeal (but not for shrimp), and b) the source of Ethoxyquin in the Vietnamese shrimps was the imported fishmeal from Latin America, which is also used by other exporting countries such as Thailand or Indonesia. Thus, the Vietnamese government and exporters' associations argue that it is not fair that only their shrimp will be the target of intensive monitoring.

NAFIQAD director visited Japan to request adjusting the MRLs for Ethoxyquin based on the risks to human health. The Vietnamese government made a list of fishmeal containing Ethoxyquin with its MRLs and issued documents not to use fishmeal containing this chemical (VASEP 2012c). The exporters interviewed expressed great concern over this issue and mentioned that many of the exporters are now refraining from exporting to Japan due to the fear of being detected once again (another detection of violation would increase the inspection rate to 50%). They said that the Ethoxyquin is also included in the feed of pigs, chickens, and fish in order to maintain the quality. Shrimps can feed on soybeans but that would result in low quality as shrimps need a lot of nutrition until close to harvesting. In order to test for Ethoxyquin, they need to import some testing kit, adding the costs to the exporters. One exporter estimated that the inspection fee increased as much as 20-30 cents per kg of shrimp after this incident.

In fact, there were similar incidences in the past, such as the case of Enrofloxacin (2011) and Trifluralin (2010) for shrimp export to Japan. After the detection of violation at the Japanese ports, the Vietnamese government decided to include both in list of prohibited chemicals (the Circular 03/2012/TT-BNNPTNT for Enrofloxacin and the Circular 20/2010/TT-BNNPTNT for Trifluralin; VASEP 2010;2012b).

5.1 What Measures are Taken in Vietnam?

Processors/Exporters

Even with this increasing number of certificates, certifications requirements seem to be mostly satisfied by the exporters. When you visit these exporters, you quickly notice that they have many framed certificates hang on the walls in the offices. Although exporters express complaints, particularly because they need to incur all the costs to obtain these certificates, they still decide to obtain them to continue their business. Most of the exporters also have in-house labs to check the chemical residue levels (see Figure 10). They test the residue level before purchasing from traders or smallholders and before shipping to export. Some exporters also mentioned the use of outside labs which can detect antibiotics more accurately for shipment to countries like Japan where the testing is very stringent. These types of private labs are also available in the country. Processors which have a special relationship with importing firms (i.e., subsidiary firms, long-term suppliers, contractors) are in a better position to receive technical advices and information about the required standards relative to other independent firms. We observed that some processors have Japanese technical experts sent by their buyers who work in their factories, monitor the production processes, and offer advices for improvement on a daily basis.

Small-scale Farmers

According to the interviews and field surveys conducted in June 2012, the greatest difficulty of compliance seems to lie at the level of small-scale producers as there are a large number of them. First of all, many farmers even do not know what the standards are. According to Khiem and others (2010), 36% of farmers were not aware of these quality and safety standards in 2008. For popular standards, such as SQF and GlobalGAP, the MARD has put a lot of efforts to increase awareness of smallholders by offering them training sessions and by offering to shoulder 50% of the application costs to obtain certificates. However, according to the extension workers, the number of smallholders who have actually obtained these certificates is trivial because a) the certification costs are high, b) they have their own farming experience and do not see the necessity of being certified, and c) they are "conservative." It is too costly for farmers to

acquire such standards and they are not rewarded with higher prices for the products that satisfy these standards.

Government

Various governmental and nongovernmental organizations are regulating and facilitating the development of the aquatic sector in Vietnam. Ministry of Agriculture and Rural Development (MARD) and provincial Departments of Agriculture and Rural Development are the central and local governmental agencies, respectively, that manage the development of aquaculture industry. Under MARD, the National Agro-Forestry-Fisheries Quality Assurance Department (NAFIQAD) consisting of six regional centers in Vietnam is in charge of food safety assurance and quality control in the aquaculture industry. NAFIQAD succeeded the mission of the former National Fisheries Quality Assurance and Veterinary Directorate (NAFIQAVED) in 2007 for the purpose of "assisting the Minister to carry out the state governing of quality and safety of agricultural, forestry, fishery products, and salt nation-wide."[11]

Among their activities and responsibilities, one that is important to the seafood export sector is the regular monitoring inspection for harmful substances, which is conducted annually according to "the Residue Monitoring Program for Certain Harmful Substances in Aquaculture Fish and Products." The monitoring program is considered to follow the levels of requirements by the EU. According to their report of the activity in 2010, they have inspected 154 aquatic areas in 36 provinces and cities for various species, including black tiger shrimp, white shrimp, giant prawn, and catfish. In total, 4,075 samples were inspected, in which 3,798 was from production farm, 143 samples were from hatcheries, and 134 samples were from middlemen. The results of inspections reveal the number of unsatisfactory samples (but not the names of the sites). Notably high violations were found in the use of prohibited antibiotics, particularly Trifluralin, which was newly included in the list of prohibited substance for aquaculture in 2010. When violations were found, NAFIQAD takes measures such as a) requesting to suspend production at these sites, b) requesting processors not to purchase from these sites, c) investigating the root cause for the violation, etc.

[11] From the NAFIQAD website, http://www.nafiqad.gov.vn/d-monitoring-program accessed in August 2012.

Apart from the monitoring inspection, NAFIQAD is also responsible for issuing certification to companies to export based on their inspection. In addition, all the export products need to go through random-sampling test by NAFIQAD before exporting. According to exporters, the rate of testing at the port is about 5%. NAFIQAD is also responsible for disseminating the information about the changing requirements by importing countries to the stakeholders in the sector.

During the last few years, complicated safety standards related to chemical and drug residuals and certification systems required by importers have been increasingly applied to aquaculture products from exporting countries including Vietnam. To cope with new requirements, at the national level, Ministry of Agriculture and Rural Development (MARD) have requested local authorities to focus more on improving quality of fish products even at the expense of quantity reduction. Various other new legal documents have been released to improve quality and manage hygiene and food safety in the industry. The Vietnamese government announced a Master Plan for aquaculture and fisheries sector for the period 2005-2010 and directions for 2020. At the local levels, few provincial and municipal governments have been active in training farmers and processors on how to conform to such complicated quality and safety standards and providing subsidies for application of these standards.

Non-Government Organizations/ Associations

Besides these state administration agency, Vietnam Association of Seafood Exporters and Producers (VASEP) and Vietnam Fisheries Society (VINAFIS) play an effective role in promoting the development of the industry. Among nongovernmental organizations, VASEP is an effective local association of leading seafood exporters and producers founded in 1998. They are actively representing their members in local and international collective actions and providing its members diversified services such as extension services, trade fairs, and information. VASEP also raises voices from the member exporters and producers to the government and to importing countries. Additionally, there are provincial fish associations that are supporting suppliers, farmers, processors and exporters in the industry.

5.2 Observed Effects on Stakeholders along the Value Chains

Processors/Exporters

The direct effects from the increasing standards/cerfiticates on processors and exporters are the added costs for compliances, most of the time without any increases in the sales price. For the EU and US buyers, they invest and obtain required certificates. They need to incur not only the initial costs but also annual renewing fee. For detecting the maximum residue, they conduct lab tests in-house and sometimes also use outside labs before exporting. At the ports, NAFIQAD conducts another random sampling test. Overall, the current trend has increased the expenditures that processors and exporters need to incur.

Second effect is the change in their business model to rely the supply of fish more on their own farms or their contract farmers rather than sourcing from traders or smallholders via spot markets. With the increasingly strict standards, transaction costs of dealing with many smallholders are rising. In terms of assuring traceability, it is easy to centrally control all the processes from fish production to processing rather than having to trace all the smallholders' production histories. Thus, there is a trend for processors to vertically-integrate the production activity. One exporter which owns large shrimp ponds mentioned that in their production system, each pond is labeled with an identification number. Thus, if some problems with these input shrimps were detected, they can stop using all the shrimps from that pond and investigate the cause. The exporters also issue IDs for traders who bring the fish/shrimps to their factories. However, because traders purchase from many small ponds and each pond is often too small to fill one container used for transportation, they tend to mix fish/shrimps from various ponds. This makes it more difficult to assure traceability for the inputs from traders.

This trend of vertical integration of ponds by processors is more clearly observed for the catfish sector because the catfish is more cash intensive, and less labor-intensive compared to shrimps. For shrimps, although some processors have their own shrimp ponds (a few has very large ones in the order of 500 ha), it is not as common as in the catfish sector. The reasons for this difference are: i) catfish is capital intensive product that emerged only recently so that smallholders do not have much comparative

advantage, ii) shrimps are prone to diseases and thus risky if relied on one large pond, iii) shrimps are more labor-intensive in production than catfish, iv) shrimps need coastal land for brackish water and are land-consuming. According to one exporter, in order to satisfy the processing capacity of its factory, it needs 4000 ha of shrimp farm. However, if it were catfish, the company only needs 400 ha. Thus, there are a few shrimp processing companies which have their own ponds, and even if they do, the shrimps harvested from their own ponds accounts only for 2-3%.

Small-scale Farmers

Because of the change in the business model of processors and exporters, a large number of catfish smallholders have exited the market. They either diversified into producing other fish targeted for domestic markets or downgraded their business to raising the fingerling or fish seed. On the other hand, shrimp smallholders seem to be more resistant to this change because they do have comparative advantages of producing shrimps over the processors as mentioned in the previous paragraph (i.e., labor-intensive production, land-ownership, etc.). However, as the requirement of traceability becomes even more important, it is likely that these shrimp smallholders would also likely to be consolidated in future. Among smallholders, those who have contracts with processors are in a better position to maintain their roles as fish or shrimp suppliers. However, these groups of smallholders are special as they own relatively larger ponds (thus reducing the transaction costs for the processors).

Collectors/Traders

In the catfish sector, the role of collectors and traders has declined because the processors tend to source directly from their contract smallholders and less rely on traders. Traders still operate because it requires special boats to transport the fish, but they function more as “transporters” currently rather than as “traders” in a traditional sense. These collectors offer services of transporting catfish from smallholders to processors. In the shrimp sector, the traders are still active in buying shrimps from farmers and selling to processors although their control by processors has become tighter by such means as formal registration.

6. Major issues in Import Standards Compliances

Given these market structures and impacts on stakeholders, what are the major bottlenecks for standard compliance in Vietnam? Based on the fieldwork observations, we find three major issues.

6.1 Inadequate Incentive Mechanism to Comply with Standards/Certificates

The first and probably the most important issue is the weak mechanism of enforcement of these certification/standards in the country. While the stakeholders are aware of the need for complying with the certification/standards, under the current system, there are not enough incentives for stakeholders to comply with these standards. In other words, there is neither reward for compliance nor punishment for incompliance, particularly at the levels of small-scale grow-out and fingerling farmers. They do not have the incentives to apply for SQF1000 because in practice they can still sell their fish or shrimps without these certificates and because the costly certificates do not yield higher prices. From the stage of fingerling farmers to grow-out farmers and that of grow-out farmers to collectors, few are certified and no lab test of maximum residue levels is involved in sales decision. Transactions occur based on the quality check by visual observations. Although importers, especially from EU and US, require particular types of certifications for processors, they do not strictly investigate whether the farmers who supply to the processers are also certified.

The main problem with the chemical residue is that it is not easily observable. It needs to be tested in a lab facility. It is essentially the problem of information asymmetry, where one actor in the transaction (a seller, in this case) has more information than his counterpart (a buyer). In this situation, because the buyer cannot discern the difference between a good product and a bad product, he is not willing to pay a higher price for the former. Thus, the suppliers of good products are discouraged and they decide not to supply. This is the classic “lemon’s problem” in economics, which means that “lemons” (i.e., low-quality products) drive the high-quality products out of market. If somehow, the quality becomes observable and fetches higher prices, it is expected that

two separate markets would develop for each type of products. Thus, if the processors are aiming for markets with stringent standards, they have clear options to choose.

Lab tests are the only way to detect the residue and thus quality. This is already done at the level of processors, but not at the upstream because the equipment is not widely available at the level of farmers. NAFIQAD's regular monitoring inspection is definitely one effort to enforce the high-quality in the market by chasing the low-quality away, but the sheer fact of high rejection rates at the ports of EU, US, and Japan, suggests that it is not enough. It may be that the sample size for testing is inadequate (i.e., low probability of detecting), testing accuracy is not achieved, or that the punishment after detecting violation is not effective. Lab tests are not perfect because it relies on a sample. According to one of the exporter, a sample of shrimp taken from the upper level of the container and the bottom level of the container may give a different result.

As another example, one Japanese importer mentioned that the way the test is conducted in Vietnam is not adequate at least by the Japanese standard. To test the residue level, it is necessary to crush many pieces of shrimp to obtain the extract from them, but he saw only a few is crushed when lab tests were done at one of the Vietnamese processors. He said that even if the results of lab tests prove safety and necessary documents are also well-prepared by processors, if the tests are conducted in that way, the importers must still suspect. Thus, they do voluntary inspection at their costs before importing them to Japan because they know that the Japanese port inspection is very stringent. In their words, "It is ultimately up to how sincere and serious the manager is about quality standards. In Thailand, the government control is more strictly done, even from the level of fish feed." As a reference, the share of this company's average annual costs for the quality test exceeds 80% of their average annual profit. They spend this much because they fear the effect on their reputation if their imported products are detected violation.

Certificate is a form of signaling for quality. In the world of asymmetric information, because the high-quality producers want to be recognized of their superiority, they invest to obtain objectively-approved signals that show the quality (A typical example of signaling is education). This works as long as the high quality receives higher reward. At the stage from processors/exporters to importers, it is

working. Because importers recognize these signaling, the processors/exporters have incentives to invest in them. Thus, in fact, most of processors have multiple certificates. Although the existence of various and similar certificates confuses processors/exporters and add to their costs, as a mechanism, signaling is functioning at this level. On the other hand, at the level of farmers, because their buyers, i.e., collectors or processors, do not strictly require this signaling nor value this signaling, farmers do not have incentives to invest in the costly certificates. This seems to be the root cause for farmers' disinterests in applying for certification even after attending training courses offered by MARD and being offered subsidy of 50% for application fee.

Currently, the Vietnamese government is trying to create VIETGAP, which is in accordance with the GlobalGAP and thus contains higher requirements than the SQF1000. Earlier, they have emphasized the SQF1000 and extension workers have offered trainings to farmers. However, the result is that the farmers are now aware of these certificates, but not interested in getting certified. Observing this situation, it is not clear whether the farmers' responses to VIETGAP will be any different from their current responses. It is crucially important to consider building the incentive mechanism, i.e., either reward or punishment, for the farmers to be interested in these certificates.

6.2 Weak Control of Upstream Market

Second and a related issue is the control of quality at the upstream market, particularly at the level of shrimp seed or fish seed. As lab tests are not perfect, even if the tests are conducted at the processors' level before exporting, it is still important to control the production processes of the value chain as much as possible. At stages closer to export, the quality control become strict, but the stages further away are less strictly controlled. Quality control physically becomes more difficult as it involves a large number of small-scale farmers who are also geographically spread apart, unlike the processors.

The most difficult control seems to be at the production input level, such as fish seed, feed, and antibiotics. For example, shrimp seed are grown in many part of the country and the Central province is known for producing seed. In 2011 and 2012, epidemic on shrimp, particularly on black tiger shrimp, has spread in the country,

affecting 97,000 ha of farms in 2011 (VASEP 2012a). This has been a serious concern for the sector and the share of black tiger is declining because it is prone to disease. Instead, the share of Vannamei is increasing as it is more disease resistant. The main reason for this disease is considered to be the low quality of shrimp seed. While government-owned hatcheries are certified SQF and GlobalGAP, these are only few. Since these hatcheries do not have enough capacity to supply all the buyers, many grow-out farmers must purchase from private hatcheries, some of which operate without license from competent authorities.

The Directorate of Fisheries in Vietnam, Department of Animal Health, and other relevant agencies conducted seed inspection in March 2012 in Khanh Hoa province, which is the one of the three largest seed-producing provinces. According to VASEP, only a half of the inspected hatcheries were approved to pass the standards of veterinary hygiene and given health certificate. Quoting the same source:

> *"Provincial Sub-Department of Animal Health showed difficulties in seed quarantine because a majority of seed was smuggled and out of control which caused an increase in diseased shrimp in localities. Until now, there have not been management measures of shrimp seed such as regulation on shrimp seed quality before releasing from the hatcheries, regulation on monitoring reproductive age of broodstock which can reproduce the best quality seed. Intensifying quarantine (building many quarantine stations, establishing inter-sectorial inspection team), strengthening inspection of seed producers and traders' operating conditions aren't put into practice. Compared to shrimp production in Thailand, success rate in shrimp farming in Vietnam reached 30 percent, lower than that of Thailand (70 percent) because Vietnam's supply and quality of seed are poor (pp.17-18, VASEP 2012a). "*

If seeds are not controlled properly, it is easy for the shrimps to catch diseases. That would induce farmers to use antibiotics to treat the disease. However, according to interviews to extension workers, it often happens that these farmers are not very much aware what is contained in these antibiotics. Some input sellers try to approach farmers with bags of mixed antibiotics and sometimes offer free training programs on the usage as a sales campaign. Because farmers do not wish to kill their sick shrimps, they use these antibiotics. If these are not properly managed, then the chemical remain in the body of some shrimps.

Thus, control of inputs is also critically important for the ensuring the quality of the final export products.

6.3 Still Rooms for Incompliance

Lastly, what is adding difficulty for standard compliance is the fact that there is no one common standards and certificate in the international market. The standard requirements vary greatly across various importing countries. Thus, even if one product does not satisfy the need of a particular country, the processors can shift that product to other country with low standard requirements. In fact, in the interviews, most of the processors openly admitted that when they have rejected products or products that do not meet the standards of EU, US, or Japanese market, they send those products to other markets, such as other Asian and Middle Eastern countries. They added that because these products still satisfy the standards set by these markets, it is not that they are sending the bad products.

This "loose end" in the international market works both positively and negatively for the processors. This diversity of requirements is a plus for processors because they can always find where to ship the "low-quality" product even when some problems occur. It also works negative in terms of standard compliance because this leaves room for them to be less careful in quality control in the production process. If the end product is strictly inspected by the same standard, they would have no option but to follow the strict rule.

7. Conclusion & Policy Implication

In this paper, we examined the situation of standard compliance for a particular case of Vietnam frozen seafood export sector. We have seen that the rapid expansion of this sector was not only due to the market liberalization policies but also due to their efforts to diversify destination markets, particularly when their catfish and shrimps were at risks under international conflicts. This diversification may have made the standards compliance more difficult for Vietnam because different markets require different standards. In addition, because most of the Vietnamese processors and exporters are independent entrepreneurs and not controlled by large multinational companies, unlike

the cases of Indonesia and the Philippines, it is probably more difficult to have one common standard for the production processes and management (Taya 2003).

The intensifying trade standards are adding costs for the stakeholders for Vietnam without increasing the prices. The required standards vary across importers and over time with a short-notice and are creating confusion among the stakeholders. We have heard a lot of cries from the processers during the interviews. Still, the processors and exporters try to comply as these standards present the access to export market. The great difficulty lies in the compliance of standards at the levels of small-scale farmers. In fact, because it is costly and difficult to deal with numerous smallholders and enforce standards, many processors are stopping to rely on smallholders and moving to vertically integrate the production processes, particularly for the catfish sector.

The paper concludes with some policy implications to improve the trade standards compliances for Vietnam. Firstly, a more strict enforcement mechanism is needed to ensure standard compliance. While a lot of famers are now aware of the existence of these standards and certifications, they are not willing to obtain certifications because there is no effective incentive mechanism. Secondly, because random-sampling tests of maximum residues are never perfect, it is also important to regulate the upstream market as much as possible, particularly at the levels of fish/shrimp seeds. This strict control of seeds will reduce the risks of diseases and thus the use of antibiotics. Thirdly, in addition to intensifying the monitoring by local authorities, offering access to public labs for farmers may also bring positive results by educating farmers about the situation of their fish. If they can check the status of their fish by themselves before sales, that will also give them more incentives to grow safer fish. Here, development agencies seem have important roles to play.

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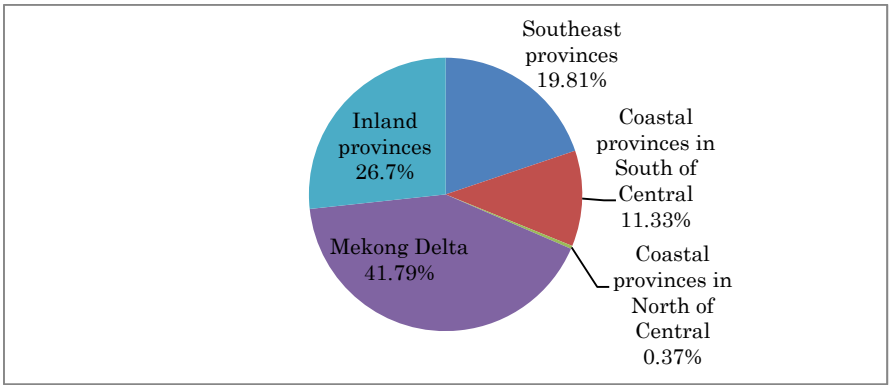
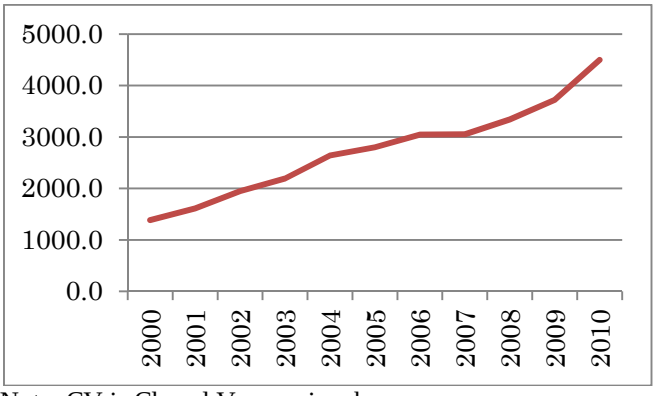
Figures & Tables:

Figure 1: Seafood Export from Different Regions of Vietnam in 2011



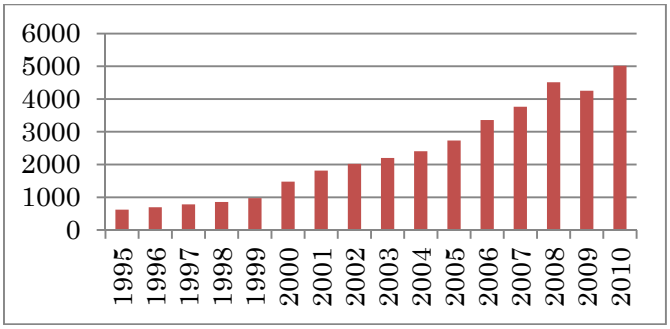
Source: VASEP (2011)

Figure 2: Total Capacity of Offshore Fishing Vessels in thousand CV



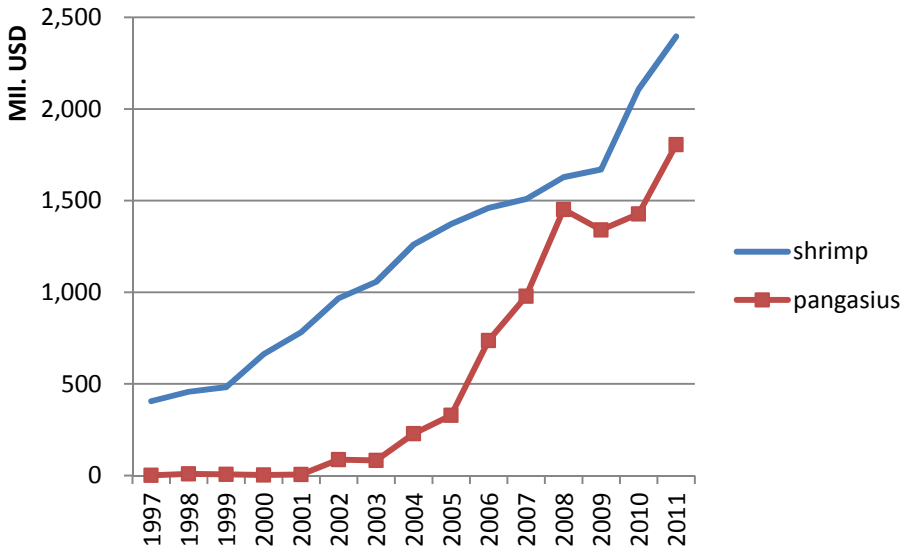
Note: CV is Cheval Vapeur, i.e., horse power.
Source: General Statistic Office (http://www.gso.gov.vn/default_en.aspx. Accessed in July 2012)

Figure 3: Export Value of Aquatic Products in million USD



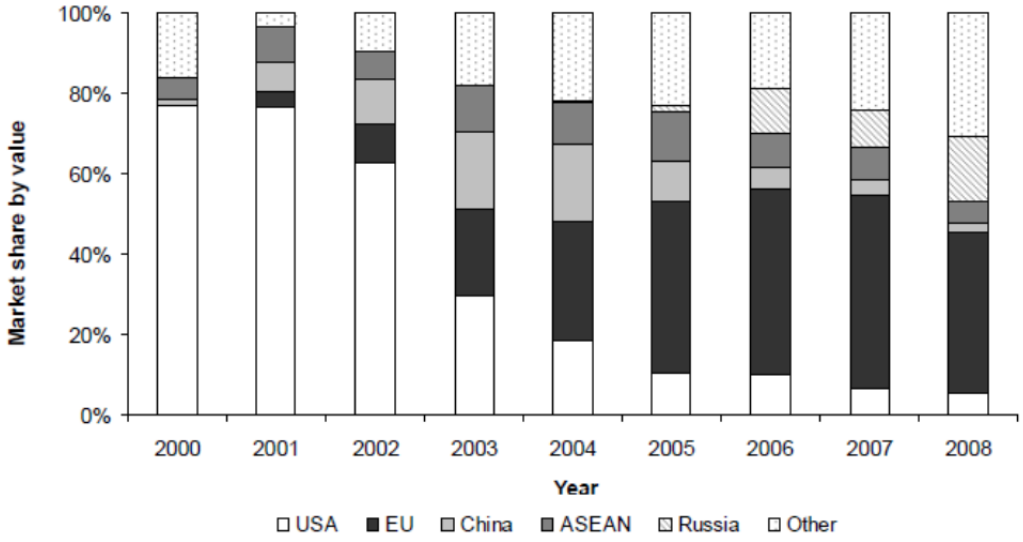
Source: General Statistic Office (http://www.gso.gov.vn/default_en.aspx. Accessed in July 2012)

Figure 4: Export Value of Shrimp and Pangasius (1997-2011)



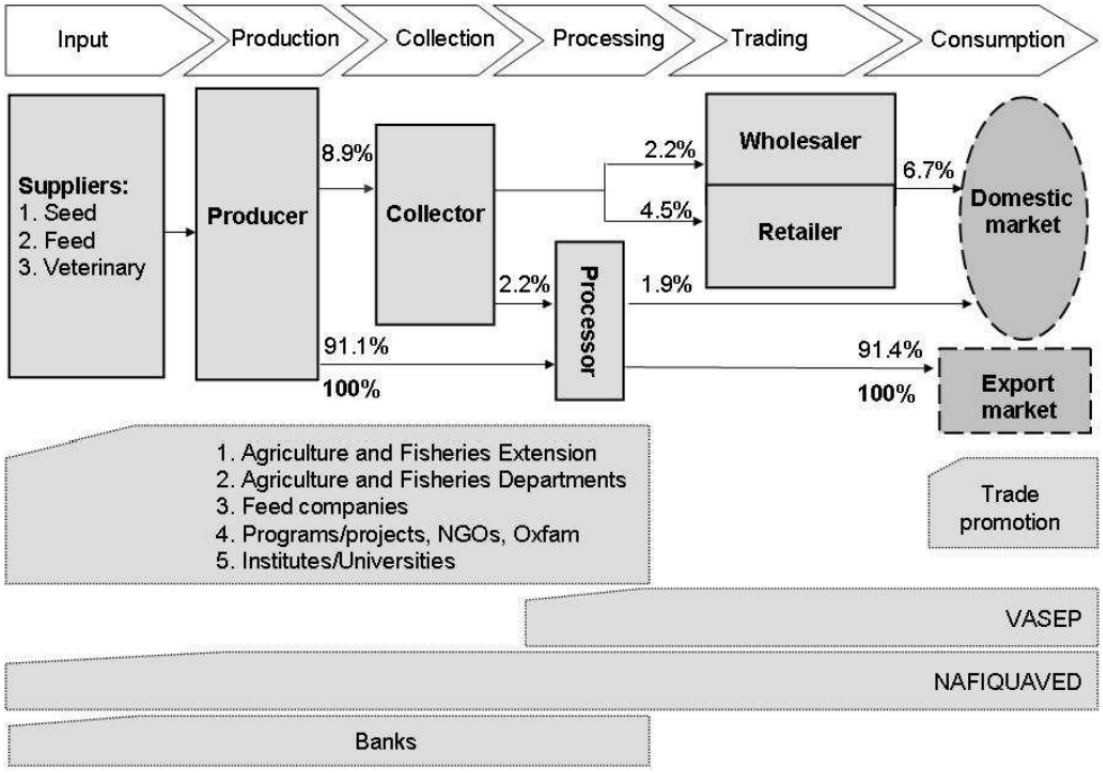
Source: VASEP 2009;2011

Figure 5: Destinations for Vietnamese Pangasius Exports



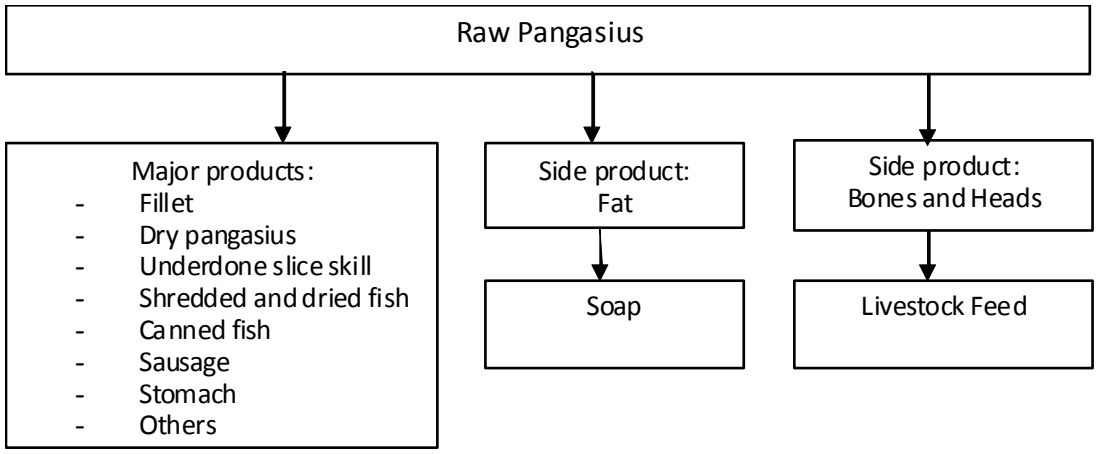
Source: Khiem and others 2010

Figure 6: Value Chain of Pangasius in Vietnam



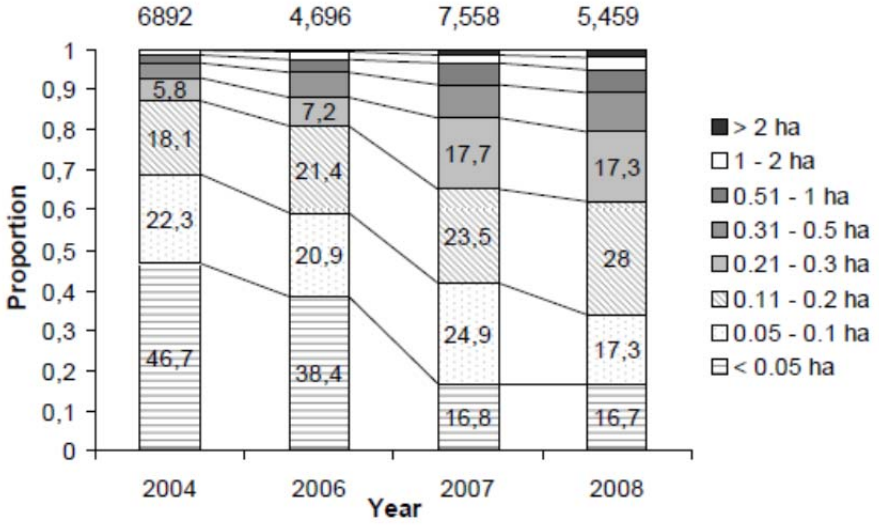
Source: Khiem and others 2010

Figure 7: Pangasius Products



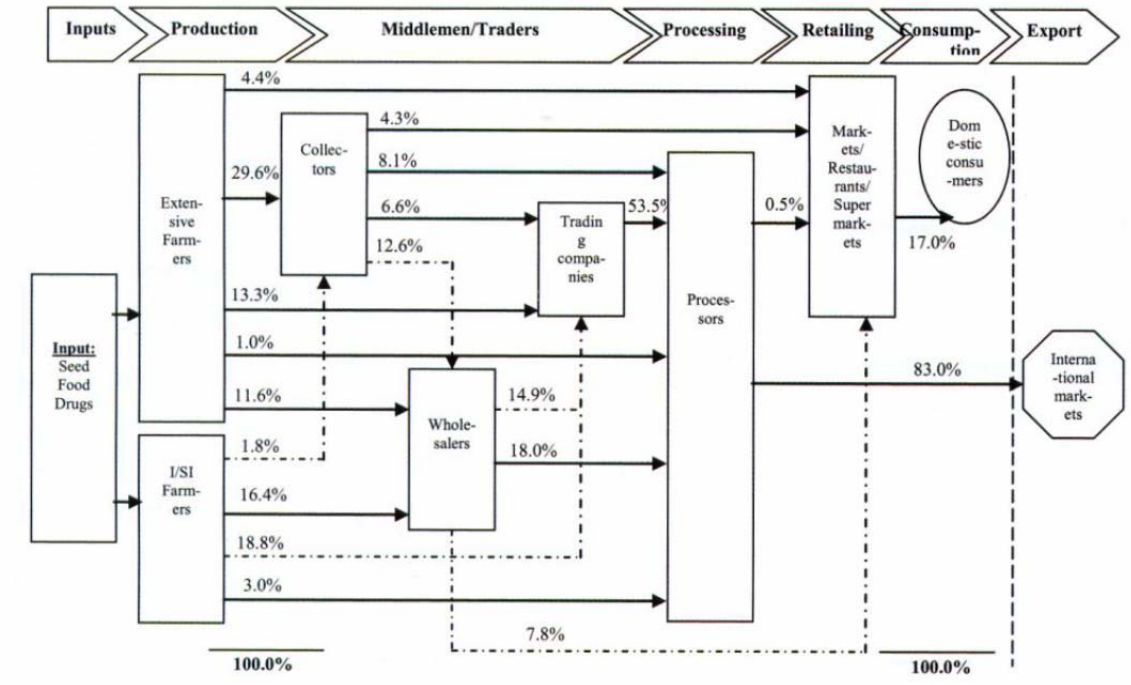
Source: Made by the authors

Figure 8: Proportion of Farm Sizes in the Pangasius Industry in An Giang Province



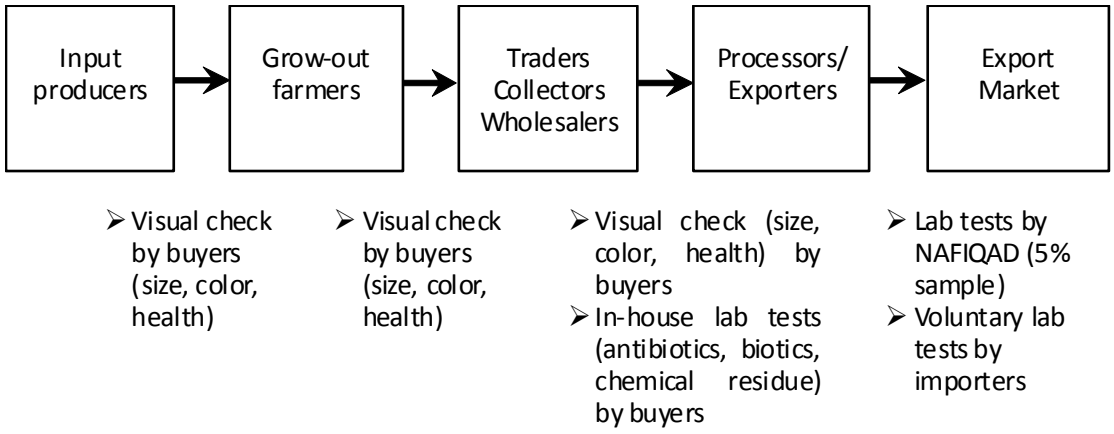
Source: Khiem and others 2010

Figure 9: Value Chain of Shrimp Production (Black Tiger) in Vietnam



Source: Le (2012)

Figure 10: Quality Inspection Conducted at Each Level along the Value Chain



Source: Made by authors based on interviews

Table 1: Top 10 Reasons and Share of Port Rejection for Vietnamese Products (EU & US 2002-08; Japan 2006-10)

EU		US		JAPAN	
Reasons	%	Reasons	%	Reasons	%
Veterinary drug residues	34.1	Filthy/unsanitary	24.4	Violation of element standard	66.7
Microbiological contaminants	26.9	Labeling	22.5	Violation of compositional standard	19.6
Heavy metals	8.4	Microbiological contaminants	21.7	Generation of mold	4.1
Industrial contaminants	5.5	Unregistered process/ manufacturer	10.6	Violation of standard of use	3.9
Product composition	5.1	Unauthorized food additives	8.0	Detection over the amount unlikely to cause damage to human health	1.8
Unauthorized food additive	4.8	Veterinary drug residues	4.8	Undesignated additive	1.8
Mycotoxins	3.7	Poisonous	3.0	Aflatoxin (mycotoxin) detected	1.4
Biotoxins/contaminants	2.4	Biotoxins/ contaminant	2.8	Non-conformity with standard for materials (lead, cadmium)	0.4
Pesticide residues	1.5	HACCP	0.8	Packaging	0.4
Bad or insufficient controls	1.3	Mycotoxins	0.6	Violation of toy or its materials standard	0.2

Source: UNIDO 2010; the Ministry of Health, Labor and Welfare, Japan (http://www.mhlw.go.jp/topics/yunyu/ihan/ Accessed in August 2012.)

Table 2: World Aquaculture Producers (in million tons)

Countries	2000	2002	2004	2006	2008	2010
China	21.52	24.14	26.57	29.86	32.73	36.73
India	1.94	2.19	2.80	3.18	3.85	4.65
Vietnam	0.50	0.70	1.20	1.66	2.46	2.67
Indonesia	0.79	0.91	1.05	1.29	1.69	2.30
Thailand	0.74	0.95	1.26	1.35	1.33	1.29
Bangladesh	0.66	0.79	0.91	0.89	1.00	1.31
World Total	32.42	36.78	41.90	47.28	52.93	59.87

Source: FAO Yearbook (2009) and FAO (2012)

Table 3: Area of Water Surface for Aquaculture (in thousand hectares)

	2000	2002	2004	2006	2008	2010
TOTAL	**641.9**	**797.7**	**920.1**	**976.5**	**1052.6**	**1066.0**
Area of sea and brackish water	**397.1**	**556.1**	**642.3**	**683.0**	**713.8**	**728.5**
Area for fish	50.0	14.3	11.2	17.2	21.6	26.5
Area for shrimp	324.1	509.6	598.0	612.1	629.2	645.0
Area for mixed and other aquatic products	22.5	31.9	32.7	53.4	62.7	57.0
Area for breeding	0.5	0.3	0.4	0.3	0.3	0.0
Area of fresh water	**244.8**	**241.6**	**277.8**	**293.5**	**338.8**	**337.5**
Area for fish	225.4	232.3	267.4	283.8	326.0	324.5
Area for shrimp	16.4	6.6	6.4	4.6	6.9	7.0
Area for mixed and other aquatic products	2.2	0.4	1.1	1.7	2.2	2.3
Area for breeding	0.8	2.3	2.9	3.4	3.7	3.7

Source: General Statistic Office (http://www.gso.gov.vn/default_en.aspx. Accessed in July 2012)

Table 4: Major Export Products of Vietnam

	Unit	2006	2007	2008	2009	2010
Crude oil	Thous.tons	16442.0	15062.0	13752.3	13373.0	7977.0
Electronic parts, computer and their parts	Mill.USD	1807.8	2165.2	2640.3	2763.0	3590.2
Articles of plastic	Mill.USD	452.3	709.5	933.7	867.4	1049.3
Electrical wire and cable	Mill.USD	705.7	882.3	1009.0	891.8	1311.1
Footwear	Mill.USD	3595.9	3999.5	4769.9	4071.3	5122.3
Textile, sewing products	Mill.USD	5854.8	7732.0	9120.5	9065.6	11209.7
Fine art products	Mill.USD	119.5	217.8	385.5	1296.2	…
Coffee	Thous.tons	980.9	1232.1	1060.9	1183.0	1218.0
Rice	Thous.tons	4642.0	4580.0	4744.9	5969.0	6886.0
Wood and wooden products	Mill.USD	1943.1	2384.6	2767.2	2989.3	3435.6
Fishery products	**Mill. USD**	**3358.0**	**3763.4**	**4510.1**	**4255.3**	**5016.3**
Of which:						
Frozen shrimps	Mill. USD	1262.8	1387.6	1315.6	1293.3	…
Frozen fish	Mill. USD	1083.4	1379.1	1968.7	1766.9	…
Frozen cuttle fish	Mill. USD	92.5	60.8	64.8	82.7	…

Source: General Statistic Office (http://www.gso.gov.vn/default_en.aspx. Accessed in July 2012)

Table 5: Top Ten Exporters of Fish and Fishery Products in million USD

Countries	2000	2010
China	3603	13268
Norway	3533	8817
Thailand	4367	7128
Vietnam	1481	5109
USA	3055	4661
Denmark	2756	4147
Canada	2818	3843
Netherlands	1344	3558
Spain	1597	3396
Chile	1794	3394
World Total	55750	308562

Source: FAO (2012)

Table 6: Ten Leading Importers of Vietnam Aquatic Products (value in million USD)

Rank	Importers	Jan.-Mar. 2012	Compared to the same period of 2011 (%)
1	The EU	260.4	-7.9
2	The U.S.	253.9	+18.7
3	Japan	228.6	+34.1
4	South Korea	109.2	+24.1
5	China & Hong Kong	82.8	+24.7
6	ASEAN	69.9	+17.4
7	Mexico	35.9	+19.2
8	Canada	31.4	+6.6
9	Australia	36.9	+42.3
10	Russia	22.6	-9.0
	Others	192.3	+22.3

Source: VASEP (2012a)

Table 7: Three Aquatic Products that Have the Largest Export Values from Vietnam in 2008

Destination Markets	Largest	Second largest	Third largest
The EU	Pangasius	Frozen shrimps	Cephalopods
The USA	Frozen shrimps	Pangasius	Tuna
Japan	Frozen shrimps	Cephalopods	Other Seafish
South Korea	Frozen shrimps	Cephalopods	Other Seafish
China and Hong Kong	Frozen shrimps	Pangasius	Dried Seafish
ASEAN	Pangasius	Frozen shrimps	Dried Seafish

Source: VASEP (2009)

Table 8: The Share of Import Markets of Vietnam Pangasius (%)

Destination Markets	Share
EU	30
The U.S.	16
Mexico	5
Australia	3
Saudi Arabia	3
Russia	3
Brazil	3
Ukraina	2
UAE	2
Singapore	2
Hong Kong	2
Colombia	2
Canada	2
Egypt	2
The Philippines	1
The others	20

Source: VASEP (2011)

Table 9: Characteristics of Farming Sites of Pangasius Production

	Field pond	Island pond	Net-pen Enclosure	Floating cage
Stocking density (pieces)	<20/ m^2	20-40/ m^2	30-50/ m^2	100-250/ m^3
Yield	50-80ton/ha	100-300 ton/ha	1000 ton/ha	100-300kg/ m^3
Crop cycle (months)	6-8	5-6	5-6	5-6
Meat quality (color of meat)[12]	Large % of yellow/pink	75-80% white	>95% white	>95% white
Production cost in 2006 (VND per kg)	9,000	10,000	11,000	11,000
Benefit-cost ratio (2006)	1.3	1.3	1.2	1.2

Source: Nguyen 2007

[12] Color of meat is an important indicator to assess the quality and grade of pangasius. The best quality or pangasius of grade 1 has white and light pink meat. Pangasius of grade 1 is often sold to the U.S. or Western European markets, which require high-quality fish. The lower quality or pangasius of grade 2 has light cream yellow meat. The lowest quality or pangasius of grade 3 has yellow meat (Khoi et al., 2008). Pangasius of grade 2 and 3 are often sold to markets that require lower-quality fish such as ASEAN or Eastern Europe.

Table 10: List of Relevant Certifications

Certifications	Main contents	Level applied	Coverage
SQF2000	Food safety assessment program covering processors, distributers and warehousing	Factory	Global
SQF1000	Food safety assessment program for primary producers	Farm, Hatchery	Global
HACCP	Management system for the prevention of contamination by physical, chemical, and biological hazards	Factory	Global
GlobalGAP	Initiated by the members of the Euro-Retailer Produce Association, main focus is on food safety and traceability, and concerns on social and environmental issues.	Factory, Farm	Global
BRC	Food safety and quality criteria required for supplying to UK retailers and designed to standardizing food criteria and monitoring procedures	Factory	UK
GMP	Developed by the US Food and Drug Administration for verifying the safety and purity of drug and food products	Drug & Chemical supplier	USA
ISO22000	International food safety management system involving interactive communication between chain actors, and a system management approach based on the HACCP principles	Factory	Global
ISO 9001-2000	Quality management system for providing consistent products and services to meet customer expectations focusing on quantitative measurement of performance	Feed suppliers	Global
BAP	Address environmental and social responsibility, animal welfare, food safety and traceability in a voluntary certification program for aquaculture facilities	Farms	Global
OHSAS	British standard for occupational health hand safety management system	Factory	UK
PAD	Pangasius Aquaculture Dialogue, Initiated by WWF and is a set of standards based on the multi-stakeholder consultation.	Farms	Global
BMP	Targeted to improve farmers' management practices, delivering increased profitability and environmental performance by making more efficient use of resources.	Farms	Global

Source: Khiem and others 2010;Mantingh and Nguyen 2008