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## Quality management in the Pangasius export supply chain in Vietnam

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*Document Version*

Publisher's PDF, also known as Version of record

*Publication date:*

2011

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Khoi, L. N. D. (2011). *Quality management in the Pangasius export supply chain in Vietnam: the case of small-scale Pangasius farming in the Mekong River Delta*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen, SOM research school.

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## 7 Quality Control and Quality Assurance at the Fish Processing Firm

### 7.1 Introduction

This chapter examines the quality control and quality assurance system at the processing firm. At the present, approximately 40 Pangasius processing companies exist, mainly located in An Giang, Dong Thap and Can Tho provinces, with a capacity of 3,300 MT/day (VASEP, 2008). The information about the processing firms was achieved by interviewing the quality control managers of five processing/export firms namely AGIFISH, BINHAN, CUULONG, VINHHOANG, and AFIEX. The processing firms are selected that produce for the export markets are selected, and they include all three kinds of ownerships (joint stock, private, and state-owned firms) and are located in survey areas (section 4.3.3). Moreover, these companies are large and medium sized according to the Vietnamese government<sup>19</sup> (table 7.2) The information focuses on quality control of raw material and processing operations conducted by processing/export firms to meet the requirements of NAFIQAVED and EU inspectors (chapter 6). Practically, processing firms are inspected and approved on an individual basis by NAFIQAVED to ensure that they comply with EU requirements for fishery products (for example raw material control for antibiotic residues, identification of critical points in the processing establishment, establishment and implementation of methods for monitoring and checking such critical points, taking export fish samples for analysis in an approved laboratory, and keeping a written record of these controls for at least two years). Moreover, the European Commission represented by the FVO periodically performs checks to ensure that the NAFIQAVED conduct this task in a satisfactory manner. In addition, fish processing firms are urged to perform “own checks” based on the principle of Hazard Analysis Critical Control Point (HACCP).

This chapter initially discusses the export markets and the quality requirements of different markets of Pangasius products. Subsequently, the quality control of raw materials and the sourcing policy of processing companies is analyzed. The chapter highlights the strategy for assuring Pangasius product quality before

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<sup>19</sup> According to decree No.91/2001/CP-ND of the Vietnamese government, SMEs “are independent business entities which have registered their business in accordance with prevailing laws, with registered capital of not more than VND 10 billion (equivalent to about US\$650,000) or an annual average number of employees of not more than 300 people”.

being exported to the European Union, the United States, and other markets. Afterward, the quality control and quality assurance at the processing firms are described. This chapter focuses on the processing operations completed by processing/export firms to meet the quality requirements in export markets. Finally, the chapter concludes by summarizing the main findings.

## **7.2 Output: customers (Pangasius export markets)**

Pangasius is mainly produced for export (91.3%, figure 2.3). Pangasius is exported to over 80 countries worldwide (VASEP, 2008). At the present time, the major importers of Pangasius are the European Union, the United States, Russia, and ASEAN. The largest market is the European Union (44%), next Russia (13%), ASEAN (9%), United States (5%), Australia (3%), China/Hongkong (5%), and other new markets such as Ukraine, Egypt, and Mexico in the year 2007 (figure 2.4). The European Union importers recognized Pangasius fillet products as whitefish which costs about half as much compared to other quality white fish (VASEP, 2009). Among EU markets, the average unit price of Pangasius products is the cheapest compared to fish products from other countries (FAO, 2007). In terms of unit price, the Netherlands and the United States paid the highest average price per imported kilo, while Russia and the Ukraine paid the lowest (table 2.4).

At current time, the criteria applied for fish quality are color, size, disease and antibiotic residues (see box 1 in appendix 7.1 for more details). The first two criteria, color and size<sup>20</sup>, are important for the price of fish and export markets. The United States and European Union prefer white and pink meat and are willing to pay a higher price for it; while yellow meat is only be sold for a lower price (lower quality standard) to markets in Eastern Europe such as Russia and the Ukraine and ASEAN countries such as Singapore and South Korea (VASEP, 2008). Moreover, the accepted Pangasius size of fillet is more flexible in the Russian and ASEAN markets. The other two quality criteria, disease and antibiotic residues,<sup>21</sup> concern product safety for consumer health. These criteria can not be controlled based on visual checks alone. To fulfil the stringent safety and traceability criteria of export markets, fish supplies from farmers must be tested at the harvest. Table 7.1 summarizes the quality requirements, volumes, and price fluctuations in the main markets in 2008.

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<sup>20</sup> The color and size of fish are affected by farming practices such as quality inputs, pond location, water supply, and good aquaculture technology.

<sup>21</sup> Disease and antibiotic residues are affected by veterinary drugs used for disease treatment.

**Table 7.1** Different markets of Pangasius fillet products in 2008

Markets	Volume (tonnes)	Price (US\$/kg)	Quality requirements	
			Color and size	Analytical method used for antibiotic residues testing
EU	224,310	2.70	- White and pink - 120 – 170 grs	Limit of detection: less than 1 part per billion (ppb)
US	24,179	3.17	- White - 170 – 225 grs	Limit of detection: less than 1 part per billion (ppb)
ASEAN	33,953	1.60	- Yellow 225 grs up	Limit of detection: less than 5 part per billion (ppb)
Russia	118,155	1.68	- Light yellow -170-225 grs or 225 grs up	Limit of detection: less than 5 art per billion (ppb)

Source: VASEP, 2009.

Table 7.1 shows that major differences exist in Pangasius export markets. The largest quantities are exported to the European Union and Russia. Higher prices are paid in the US and EU markets and lower prices are paid in Russia and the ASEAN markets. This price spread is related to quality requirements or antibiotic residue testing. Stringent testing regimes are imposed by all importing countries. However, significant differences in the standards for antibiotic residues exist, i.e. the standards applied in the European Union and the United States are more critical than the standards applied in Russia and the ASEAN import countries. In 2009, Russia and the ASEAN countries announced that, as of 2010, their standards will be more in line with the EU and US limits (VASEP, 2009).

To consolidate and expand their position in the international markets processing/export companies facilitate better management systems to meet international standards. These systems are particularly important as retailers and consumers in the European Union and United States are expanding their focus to include environmental and social standards such as organic and Global-GAP standards. The processing firms buy what they sell in the EU and US markets. The major importers usually order the fish quality and quantity in advance (six months to one year), and the processing firms base their buying strategy on the orders (volume, quality, size, trimming, packaging, price, etc.). In the buying contract, the price is referenced in the European price report, which indicates the major fish price of each country monthly. This price is published on the Globefish Website and is based on information supplied by industry correspondents that aims to provide guidance on broad price trends. However, fish prices are determined by supply and demand in a competitive marketplace as well as the negotiation between exporters and importers, which is based mostly on the prices offered by importers (expert interview, 2009).

Moreover, the processing/export firms will sell what they buy in other markets such as Russia and ASEAN countries with lower price and quality. They purchase raw fish materials from small-scale farmers to supply these markets. As a result, small-scale farmers receive a lower price and they lack long-term business relationships with the processing/export firms because the processing firms contact them only occasionally if they lack raw materials.

### 7.3 Input: suppliers

Presently, processing/export firms in the MRD purchase Pangasius raw materials from difference sources. There are four sources of fish raw materials namely the company’s own farming, the affiliated companies’ farms, fishery associations, and independent farms. Table 7.2 shows the sourcing strategy of five interviewed Pangasius processing firms.

**Table 7.2** Sources of Pangasius raw materials

Companies	Number of employees	Type of company	Production capacity (MT/day)	Source of Pangasius raw materials			
				Own farming	Affiliated company’ farms	Fishery association	Independent farms
AGIFISH	1,200	Joint stock	200-250	60%	30%	5%	5%
BINHAN	400	Joint stock	80-100	60%	10%	10%	20%
CUULONG	1000	Private	150-200	30%	30%	20%	20%
VINHHOANG	1,100	Joint stock	200-250	50%	30%	10%	10%
AFIEX	280	State-owned	50-80	30%	25%	15%	30%

*Source: Survey1, 2008.*

The interviewed processing firms (2008) showed a strategy with respect to what to sell on different markets. For the markets with high quality requirements such as the European Union and the United States, the processing firms tend to use raw materials from their own farms or affiliated farms in order to be able to assure quality and to supply fish with a higher percentage of white and pink color. These markets require companies to provide details about their operations to guarantee quality. Therefore, the processing firms that concentrate on EU and US markets tend to apply good aquaculture farming practices as well as certified inputs for Pangasius production. However, other markets such as the Russian and ASEAN markets are less strictly involved in food safety and quality; moreover, the fish price is also lower than in the EU and US markets. The processing firms that concentrate on the Russian and ASEAN markets tend to procure raw materials from traditional farmers because they receive benefits

from outsourcing, such as decreased risk of losses caused by fish diseases and reduction of production cost, which applies to advanced production systems.

To attain a clear picture of a company's sourcing strategy, we take the case of AGIFISH Company. The main markets of AGIFISH are the European Union (60%), Russia (15%), ASEAN countries (10%), and the United States (3%) (AGIFISH, 2008). For the EU and US market, AGIFISH tend to purchase fish from its own farms and affiliated APPU members. Each year, AGIFISH makes a purchasing plan based on the orders received. However, if demand is greater than supply from its own farms and affiliated APPU members, AGIFISH covers the deficit with fish from preferred farmers.<sup>22</sup> AGIFISH purchases fish from preferred small-scale farmers regularly to supply other markets such as Russia and ASEAN countries. The small-scale farmers have a weak bargaining position in their business relationships with the processing company and consequently receive lower prices because their supply generally does not fulfil the standards required for premium export markets (the EU and the US markets).

A survey (2008) indeed revealed that the relationship between small-scale farmers (individual farmers and FA members) and processing firms is characterized by informal agreements rather than enforceable contracts. There are no guarantees that the processing firms will purchase the fish from the farmer (Khoi et al., 2008).

Remarkably, nearly 50% of the raw materials come from companies' own farm, while 25% come from affiliated companies' farms, 12% come from FA, and 13% come from independent farms. With the first two sources of raw materials, the fish quality is assured by quality management systems, and processing firms give priority to these assurances. Hence, we argue that small-scale farmers' positions strengthen by improving relationships and coordination between farmers and processors. The experiences in fish farming in India (Umesh et al., 2009) demonstrated that small-scale farmers must adopt BMPs to produce fish quality and improve prices (see chapter 3). These results are achieved only through working in farmer groups. By cooperation, the ability to adopt codification schemes is stronger. Consequently, the supplier's capability to meet the buyer requirements tends to increase.

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<sup>22</sup> AGFISH has a list of prefer farmers who have a good record in supplying good quality fish to fulfill the quality requirements of company.

## **7.4 Quality control of fish raw materials sources**

### **7.4.1 Processing companies' own farms**

The first source of Pangasius raw materials is from the processing companies' own farms (table 7.2). The company's own farms are established in the region where water circulates well and residential density is low. Ponds are designed and built according to good farming practices in combination with environmental protection (interview, 2008). These companies' own farms are certified for SQF 1000<sup>CM</sup> by third party, namely SGS.<sup>23</sup> Hence, standards for traceability are met. In this case, the processing firms participate in multiple value-adding activities and no distinction is made between primary and secondary processing. The reason these companies set up their own farms is to gain better control over primary production, thereby guaranteeing supply quality and traceability of their raw materials (survey, 2008). The companies aim to maintain long-term relationships with their customers and thus adapt to the stringent quality and safety standards and regulations in the EU and US markets.

### **7.4.2 Affiliated farms**

The second source of Pangasius raw materials is supply received from affiliated farms. The farmers are subjected to a close degree of monitoring and intervention by the processing firm (buyer), and they are dependent on the buyers in terms of input and output control. All interviewed companies have organized vertical coordination between companies and farmers such as AGIFISH with APPU, AFIEX with ANPA<sup>24</sup>, VINHHOANG with Trace Panga Project<sup>25</sup>, NAMVIET with Clean and Safe Pangasius Association, and BINHAN with Bianfishco Nature Pangasius Project. Processing firms establish business relationships with these farmers through providing services, information, and technical know-how concerning quality of fingerlings, feeds, and usage of veterinary drugs. In addition, processing firms also offer free laboratory services for fish disease diagnosis and treatment for affiliated farmers. In addition, the affiliated farmers receive the SQF 1000<sup>CM</sup> course for free and earn SQF certification for the group of farmers (case of APPU). These affiliated farmers apply good farming practices such as proper production methods, and appropriate administration of veterinary drugs to prevent harm to consumers and the environmental (all inputs such as feed, fingerlings, and veterinary drugs need to be recorded; inputs must be clearly identifiable and allowed by

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<sup>23</sup> SGS: Societe Generale de Surveillance is the international Certification Body

<sup>24</sup> AFIEX Natural Pangasius Association (ANPA). AFIEX financed feeds and buying of ANPA's products with priority

<sup>25</sup> Trace Panga Project includes feed programs, veterinary controls, environmental awareness, and bacteriological control

NAFIQAVED; maximum allowed density of fingerling is 25 fingerlings/m<sup>2</sup>). Moreover, the company's quality assurance team checks the farm at least once a month and has on farm discussion with farmers on the farm regarding quality control issues. As the companies' affiliated farms are supervised by the processing companies for proper farming practices, they achieve better quality than other farms (Survey 1, 2008).

### **7.4.3 Fishery association**

The third source of *Pangasius* raw material consists of farmers who belong to a producer organization (fishery association). The fishery association offers several services to its members. It provides information on how to produce *Pangasius* and offers advice for disease treatment, financial services, and market information. However, members of a fishery association control the quality of their farm by themselves. The fishery association encourages members to implement a quality assurance system at the farm level like SQF 1000. However, the members of the fishery association must pay the SQF training costs (US\$250 per person) themselves. Currently, some members of fishery associations follow the standards but they do not pay the certification fee because it is too high. SQF schemes have several requirements that are difficult for small-scale farmers to comply with. Examples of such requirements are the high number of written documents required, the high number of control points that must be met and the need for registration of feeds and chemicals used. Fish health management must also be conducted under the supervision of a veterinarian, which at present is difficult for most small-scale farmers. Others face problems in complying with SQF standards like the waste-water treatment pond and detailed record-keeping. These small-scale farmers do not have the motivation to make the necessary investments in production such as a waste-water treatment pond (see chapter 8) due to fluctuation in prices and demand. They must be assured a price and minimum demand to fulfill these standards. Generally, fishery association members control fish quality better than other independent farmers because they receive more training and information on good farming practices (expert interview, 2009).

### **7.4.4 Independent farmers**

The fourth source for *Pangasius* raw material is independent farmers. In this case, processing firms cannot control the quality of inputs (fingerlings, feeds) and usage of drugs on independent farms. Moreover, independent farms are less acquainted with export quality requirements and regulations. The reason companies purchase fish from this source is a lack of raw material to supply customers for the whole year. Moreover, the companies need diversity of *Pangasius* quality to abide by the different market requirements. The business

relationship between independent farmers and processing firms is characterized more by informal agreements than by enforceable contracts (Survey 1, 2008). There is no guarantee that the processing firms will purchase fish from the farmer. Small-scale farmers normally contact processing firms at the harvest time and through a registration process. At that time, the processor will check the fish quality by taking samples. Prices are negotiated after the results of Pangasius quality checking are known, and the prices depend on the market situation. If the color, size, and antibiotic residues do not match the requirements of the processor the price will be lower or the fish might even be rejected completely.

#### **7.4.5 Quality assurance and governance of raw materials**

*The first source of raw material* complies with *the* hierarchy governance form according to Gereffi, 2005. The hierarchy governance form has a joint ownership of resources at the farm and firm levels. In this form, the processing firms take direct ownership of the operations and the fish quality is assured by a quality assurance system, which is organized by the processing firms.

*For the second source of raw materials* is similar to the captive governance form according to Gereffi, 2005. The captive governance form represents integrated relationships between farmers and processing firms (case of APPU). In this form, farmers remain legally autonomous, but they are heavily dependent on processing firms that provide all critical resources such as fingerlings, feeds, drugs, etc. Moreover, the processing firms and farmers are highly coordinated through contractual relationships.

*For the third source of raw materials*, the governance form that best applies is the relational governance form, as defined by Gereffi, 2005. In this form, the frequent coordination between buyers and suppliers is necessary to assure the required quality. Through relational governance, the FA members increase market access by improving technology, exchanging market information, and enhancing bargaining power with buyers.

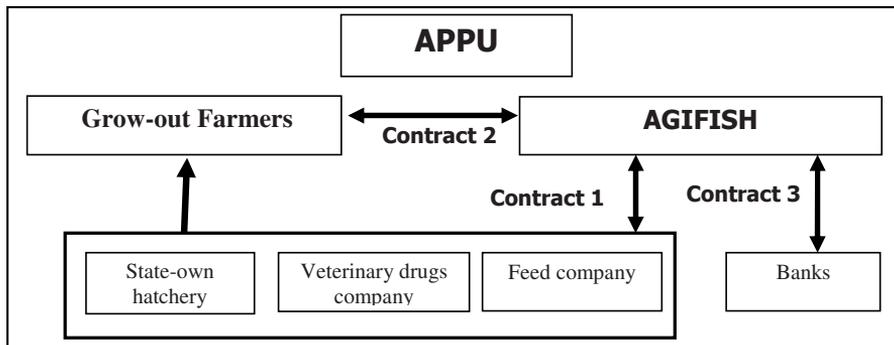
*For the fourth source of raw materials* operates most similarly to the market governance form in Gereffi's concept. The market governance form involves spot market exchange between independent farmers and processing firms. In this form of governance, the buyers and suppliers negotiate only short-term relationships, and they are prepared to change their purchasing behaviors quickly.

To understand the quality assurance of fish raw materials, we examine the case of APPU as an example for affiliated farms. The business relations between

AGIFISH Company and the APPU group are based on contracts. In general, the terms of the contract are written in detail, which clearly indicates the responsibilities of both sides for fish quality and farming practices. In the contract, the main requirement stipulates that farmers buy their inputs only from certified suppliers which are contracted by AGIFISH Company. Moreover, SQF standards must be met. The AGIFISH Company assists APPU members to obtain group certification through the SQF standard, thereby developing responsibility for fish safety and quality. The SQF standard requires the APPU to adopt a good management structure including four units: (1) the screening of farmers to join the union; (2) the clean production unit—which supervises and provides information to farmers and tests batches sent to processing factories at the site of harvest, thereby adding an extra level of testing compared to other traditional farms; (3) internal auditing of farmers to ensure they meet standards; and (4) the management of supply—farmers must buy their inputs only from certified suppliers in the SQF system.

AGIFISH also organizes training courses in good aquaculture practices applicable to SQF standards for APPU members. In addition, the company’s technician support and monitor production techniques of members. The company ensures procurement of all outputs as required by SQF production standards.

**Figure 7.1** Quality assurance system of Pangasius production at AGIFISH



Source: AGIFISH, 2008

AGIFISH signs contract 1 (figure 7.1) with certified input suppliers (An Giang state-owned hatchery, Vemedim veterinary drug company, and Proconco feed company). The contract allows APPU members to order quality inputs from certified suppliers.

Through contract 2, AGIFISH provides technical support to its members concerning quality inputs, free fish-disease testing, and disease prevention/treatment advice. This contract specifies the conditions under which APPU farmers can receive inputs (mostly feeds) on credit from input suppliers (contract 1), and they can use the contract to apply for credit from the bank (contract 3). In addition, APPU members also receive information on export markets as well as on hygiene and food safety of each market. However, the APPU members must guarantee to use the quality input contracted by AGIFISH and keep records for product traceability. In addition, the price will be paid at a fixed complementary price (+/-10% negotiated price between AGIFISH Company and APPU members<sup>26</sup>). Generally, APPU members must supply quality fish to AGIFISH as stated in the contract and follow an agreed schedule. At the harvest time, if the APPU members have a larger volume of fish than the fish volume contracted with AGIFISH Company, they can sell fish either to AGIFISH with price negotiation or to other export companies offering a better price.

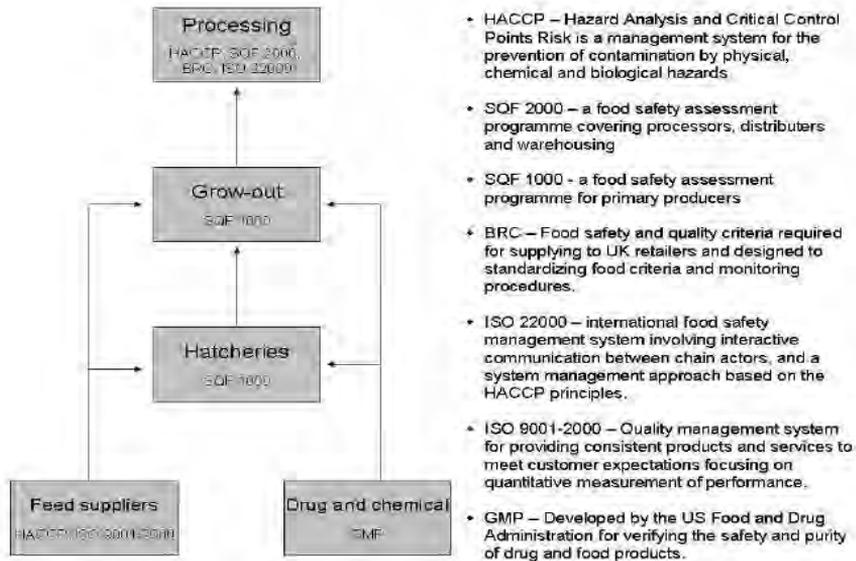
Through contract 3, AGIFISH negotiates an attractive interest rate for APPU members. The bank provides loans to APPU members according to the appropriate progress and amount through AGIFISH as a crucial representative. The loan amount is based on the contract between APPU members and AGIFISH (contract 2).

Generally, the APPU activities are based on a series of certification standards for the design, function and auditing of food quality and safety as summarized in figure 7.2. As standards become more stringent in the industry these systems may also become important platforms for the development of improved environmental and social performance. This progress is already evident in some of the companies that have adopted environmental management systems for their processing activities such as ISO 14001 and social responsibility certification for their labor force through SA 8000.

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<sup>26</sup> Negotiated price is referenced on the export price of AGIFISH Company signed with importers and based on production cost plus profit of APPU farmers. Hence, both parties receive benefits in case of marker price fluctuation due to sufficient market information. The negotiated price is recalculated after each crop.

**Figure 7.2** Certified system of quality standard of APPU model



Source: AGIFISH, 2008.

For the last two raw material sources (FA members and independent farmers), quality assurance is conducted at the harvest period by testing fish samples. All processing firms follow a procedure for quality inspection of raw materials prior to processing. Fish samples of each farming pond are taken two or three weeks before harvest. Most processing firms have a laboratory for microbiological control of samples. When receiving the samples of fish, the quality control department conducts a sensory check and a size check and estimates the fat content of the fish (Survey 1, 2008). Additionally, some larger processing firms like AGIFISH, VINH HOANG, and BINH AN have a laboratory well equipped for analyses of antibiotics. But, these analyses are only able to estimate only the total plate count (TPC)<sup>27</sup> and cannot check for all antibiotic items. Therefore, processing firms must send samples from all suppliers for special analyses to NAFIQAVED; such analyses detect the residue levels for Nitrofurans, Chloramphenicol, and Malachite green. This practice is encouraged by NAFIQAVED, as their laboratories were assessed and accredited by VILAS (refer to chapter 6)<sup>28</sup>. The farmers are informed about the results of the analyses seven to ten days before harvest. At this present time, processing firms conduct one more antibiotic test one or two days prior to harvest to ensure that antibiotics have not been used in the meantime. If the residue levels are lower than the maximum allowable limits, the fish are harvested and sold for export. If residues

<sup>27</sup> Total plate count is a microbiology analysis to count the amount of bacteria.

<sup>28</sup> VILAS: Vietnam Laboratory Accreditation Scheme

still remain, fish are sold at other, less strictly markets such as Africa, ASEAN, but not to the EU and US markets (expert interview, 2009). Although export of this supply is currently possible, it is expected that export markets will soon apply equivalent measures for fish quality and safety in the near future. Consequently, farmers who want to participate in export markets must adapt their farming practices to maintain market access.

Before harvest, the fish are starved for two days (according to the contract with the processor), then using a special group of people to harvest fish. The fishes are transported to processing factories by well boat. Each well boat transports 10-15 tonnes. The transport takes from one to 10 hours, depending on the distance. Fish are weighed at the farm by counting the number of full baskets when loading the well boat. Dead fish is rejected at the factory. The processing factories require documents for each boat load such as declaration of harvesting area and a guarantee letter indicating any antibiotics used (see box 8 in appendix 7.1). Based on these documents, factory workers attach a code to each load in order to trace back to the farm if necessary (Survey 1, 2008). The fish of each farm have separate batch codes and the processing firms process the fish of each farm completely before switching to the next farm. A quality control team is responsible for implementing, maintaining, monitoring and verifying these raw material practices. The aim of these practices is to make sure that the raw materials received are safe for manufacturing and comply with the required quality levels.

## **7.5 Quality control and quality assurance system at the processing firm level**

The transportation of live fish from the farm to processing firms is organized by the processing firm (refer to 5.2.4 for more details). The fish reach the factory alive and are slaughtered by cutting the gills. After bleeding in ice water, the fish are filleted by hand. Next, the skin is removed with a skinning machine. Afterward, the fillets are trimmed, checked, and classified by size and color. There are two freezing methods-either plate freezing or IQF<sup>29</sup>. Although most factories have modern equipment the process is still very labor-intensive as 80 percent of the processing is done by hand (Survey 1, 2008). After processing, the fish are packed and sold in container loads to markets (see appendix 7.2 for the description of processing steps for Pangasius frozen fillet products).

In the fish processing factories, the HACCP system is used to determine whether fish safety requirements are met (see appendix 7.3 for more details). To establish

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<sup>29</sup> Individually Quick Frozen (IQF)

the HACCP system, GMP and SSOP practices are implemented. This procedure is accomplished by prescribing an efficient production flow from raw material to finished products, removal of dirty implements and offal, and avoiding temperature increases above 5°C. A quality manager is responsible for implementing, maintaining, monitoring, and verifying good manufacturing practices.

Regarding quality control of processing, the grading, sizing, weighing and classifying of fish fillets are the most critical hazard points (Survey 1, 2008). At this stage, the fillet are classified and send to a packaging room where they are packed for transport to separate farms and ready to be traced if necessary. The workers stand at stainless steel tables while the quality control officer monitors the process. Stainless steel vacuum tumblers are positioned around the table used for sorting, grading and color classifications. The tumblers then transport the fillets to conveyor belts. During transport, the vacuum tumblers mix the fillet with STTP<sup>30</sup> or other products to keep the moisture in the fillets in accordance with market and customer requirements. This process must be very strongly controlled, as the EU markets strictly limit the use of these phosphates in fish.

By now, 100 percent of the Pangasius processing firms have performed the prerequisite programs as GMP and SSOP for applying HACCP. To fulfill the antibiotics testing of NAFIQAVED, the processing firms use laboratories that are well equipped for analyses of antibiotics. Then, fish sample testing is conducted from each farming pond before the harvest of fish is accepted (Survey 1, 2008). In addition, NAFIQAVED controls the overall performance of the processing firms through the inspection services.

The expert interviews (2008) revealed that the quality assurance system of Pangasius processing firms is implemented through a proper application of good manufacturing procedures (GMP) (see appendix 7.4) plus sanitation standard operation procedures (SSOP) (see appendix 7.5) and an HACCP plan (see appendix 7.3). GMP and SSOP are considered prerequisite programs for a successful implementation of HACCP (FAO, 2005). The GMP provides standard guidelines to ensure that the end products produced meet specific requirements for identity, strength, quality, and purity. SSOP deals with hygiene of operations and is applied to all processing areas, equipment, storage, and parameter areas that require wet or dry cleaning and sanitizing. The HACCP plan identifies limits of physical, chemical, and biological parameters to ensure an acceptable level of food safety standards.

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<sup>30</sup> SSTP is a chemical used in Pangasius fillet

At processing level, processing factories must certify their production using the HACCP standard for food safety and hygiene standard. To obtain certification of compliance with this standard, the product is randomly checked and analyzed for product quality by NAFIQAVED. In addition, processing factories are equipped with more advanced equipment to meet the higher demands of customers. Moreover, the processing firms frequently organize training courses to enhance the workers' skills. Workers' hygiene at the production site is generally maintained at a very high level. For instance, clothes, hands, and legs are disinfected at the entrance (Survey 1, 2008).

## **7.6 Conclusions**

This chapter presents the quality control and quality assurance system at the processing firm level. To maintain and assure the quality of fish, processing/export firms have applied a quality management procedure approved by NAFIQAVED and the EU commission. Generally, the processing firms are relatively well developed. For the firms, the challenge is to develop business relationships with importers based on the relational governance form. An important condition for accomplishing this goal is that they develop a convincing quality assurance system with raw material suppliers. In the future (2014), when the European Union applies the traceability rules to fishery products (VASEP, 2009), the Pangasius processing/export firms must strictly control the quality of Pangasius not only inside the company, but throughout the whole chain for traceability issues. The case study (2007) revealed that roughly 50% of raw materials are sourced from companies' own farms and 25% from affiliated companies' farms, which are easily traceable at the farm level. However, the smallholders are in a more dependent position. The major challenge at the moment is to qualify fish products for sale to high-quality markets. In the short run, a captive governance form (APPU case) seems to be the only realistic method. However, this governance style makes APPU members very dependent on the processing firms. The traditional farms must apply better management farming practices as well for fish traceability if they want to participate in high value-markets. In the longer run, the challenge is to develop business relations based on the relational form. Gereffi's relational governance concept is the most useful form for the smallholders to be included in GVC to further assure the required quality. This step is necessary to establish efficient coordination among smallholders together, and between smallholders and chain actors to improve their participation into global markets.