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Quality management in shrimp supply chain in the Mekong Delta, Vietnam : problems and measures

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1. Introduction

Food quality assurance is now recognized as essential for efficient and internationally competitive businesses. The international markets demand that all links in the food supply chain understand the customers and consumer preferences, and that suppliers meet tighter food health and safety standards and assure a consistent quality. The size of the market is difficult to estimate; however, based on the demand for assurance by manufacturers, retailers and regulators, indications are that the world food supply will be required to provide food safety and quality assurances by the year 2010. Global trends that have an impact on Food Safety and Quality Assurance can be summarized as follows :

- Demand for food is increasing on the back of economic growth
- Demand for 'safe food' is increasing
- Demand for 'quality assured' food is increasing
- Business structures are changing
- Food-borne illness occurs more frequently

The World Health Organization (WHO) reports a rising incidence of food-borne illness in industrialized countries. The potential causes of increased food-borne illness include:

- Growing numbers of immune-compromised or elderly in the population worldwide;
- The emergence of new pathogens or of anti-biotic resistance in pathogens;
- Changes in food handling, storage and preparation practices; and
- The growing movement of people, live animals, and food products across borders, which spreads disease more widely when it occurs.

In addition, the continuation of modest world economic growth is expected to result in continued strong consumer demand particularly in the developed countries of the world. The continued economic recovery in Asian countries should result in increased demand for food. Consumers are increasingly concerned about food quality and safety issues. Governments worldwide have legislated to compel the adoption of HACCP systems to ensure companies prove that food safety requirements have been met. Moreover, there is an increasing worldwide dominance of global retailers, processors and food service corporations. The emergence of supermarket chains in international business has greatly influenced the demand for a consistent supply of safe, quality food. The potential exists for food safety and quality to become a trade barrier if exporters cannot consistently deliver to customer and regulatory requirements.

Furthermore, laws are now in place in Australia, Europe and the US, which compel the adoption of the HACCP systems (Hazard Analysis and Critical Control Points) in the food industry. In Europe and the United States, this has meant food industry is now focused on the HACCP methodology and this activity is also outstripping the use of ISO 9000 quality management systems within the food industry. The verification of product safety/quality through HACCP to ensure consumer safety and satisfaction is having a major impact on primary producers and food manufacturers around the globe. The inclusion of HACCP in quality systems at all links in the supply chain is growing.

Consumers now tend to emphasize product quality and hygiene rather than quantity, leading to increasing competition on product quality. Moreover, customers have a growing demand for stable, high quality of products they would buy. Therefore, manufacturers and traders have no choice but to make good products and control product quality. In other words, consumers want to buy aquatic products in general and shrimp in particular with high quality and a hygienic and safety condition. The question that immediately arises is what world seafood firms, as well as Vietnam's seafood companies, will need to do to satisfy consumers' requirements and expectations?

To meet customer needs, the biggest seafood exporting countries in the world, such as Thailand, China and Norway are trying to develop and promote quality improvement in the supply chain in aquaculture, marine catch, processing and distribution. Particularly, Vietnam also has paid much attention to seafood quality, safety and hygiene in recent years. The Ministry of Fisheries of Vietnam issued several policies and regulations in terms of financial support and quality improvement to the local governments and seafood companies (SFCs) in order to improve the seafood, both raw and processed, that aim to meet customers' expectations. Especially, with the goal of a sea product export value of US\$2.3 billion in 2003, Vietnam is still among the 10 leading countries of the world in sea product export value, of which shrimp products represent a high percentage. Shrimp is still imported at high volume in Japan and the US, and there is a sharp increase in EU market in recent years.

However, Vietnam's aquaproduct exports have recently been contaminated by antibiotics, as well as microbiologic and other contaminants, because of low quality of the raw materials and the low hygienic and safety conditions in culture, maintenance, transportation, processing, storage and distribution. For instance, most of raw shrimp collected by agencies in the Mekong Delta (MD) steeped chemical substances for maintaining. In 2002, the National Fisheries Inspection and Quality Assurance Center (NAFIQACEN) inspected 234,691 tons of export seaproducts and discovered that 9.4% of these did not show enough safety, hygiene and quality for exporting. Specifically, Mr. Cuong, director of the NAFIQACEN, said that almost all SFCs have applied the HACCP programme, but only because it was obligatory, and not because viewed as an effective tool to ensure product quality. As a result, many seafood containers, especially shrimp from Vietnam (38% of total export volume) were destroyed or returned. Moreover, according to the OASIS (Organization for the Advancement of Structured Information Standards) from the US, in October 2002, 63% of seafood containers from Vietnam were infected with salmonella. Also, other issues related to quality in this market are wrong labels, antibiotic residues, etc.

Moreover, there are a lots of quality relevant issues, such as backward machinery and equipment to catch and maintain raw materials offshore, unskilled work force, polluted field, uncontrolled seed, lack of knowledge regarding the use of antibiotics, pesticides, and so on. These lead to low quality of raw materials, of which shrimp is a typical product. Regarding seafood processing, at present nearly 80% of seafood processing facilities in Vietnam (60% of total SFCs) are over 10 years old and can hardly meet the quality demanded for export and accordingly the value added only accounts for 15% of the total value of export. Most of Vietnam's exported seafood is unprocessed, i.e. refrigerated or frozen products. Last but not least, quality standards, such as Good Manufacturing Practices (GMP), Sanitation Standard Operation Procedures (SSOP), Safe Quality Food (SQF), British Retail Consortium

(BRC), and especially Hazard Analysis and Critical Control Points (HACCP), have not been sufficiently applied by the SFCs yet.

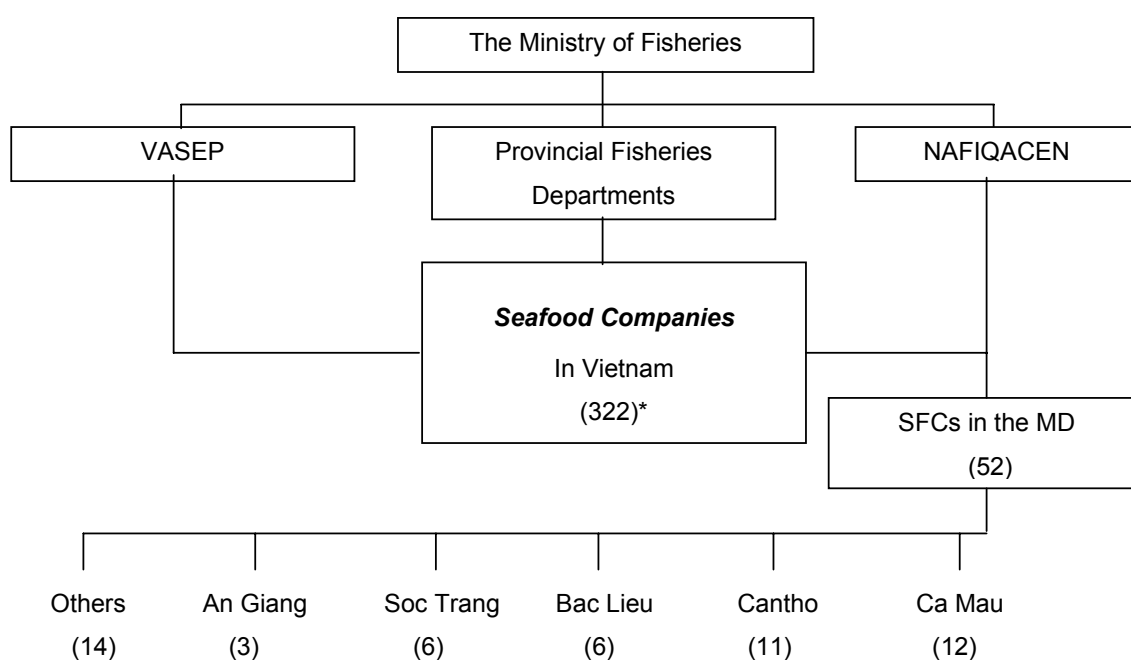
Today, consumers' requirements and expectations on sea product quality in general and shrimp quality in particular are very high. Therefore, there is an urgent need for quality improvement and assurance of Vietnam's sea products.

2. Seafood quality problems : an overview

2.1 General introduction on sea products in Vietnam and the Mekong Delta (MD) (see appendix 1 for details)

In 2002, Vietnam has 322 SFCs, of which 135 are State owned enterprises (SOEs), 130 private companies, 42 corporations, 7 joint venture companies and 8 foreign companies (VASEP, 2002). According to SFCs' leaders interviewed, all SFCs are treated fairly by the Vietnamese government with respect to policies of investment and development in spite of different ownerships characteristics. Each SFC is managed by both the Ministry of Fisheries and the local government. Besides, the companies are supported by Vietnam Association of Seafood Exporters and Producers (VASEP) and the National Fisheries Inspection and Quality Assurance Center (NAFIQACEN) for export business operations (figure 1). The VASEP is a voluntary organization of the Vietnamese enterprises processing, importing, and exporting sea products. It was established with the aim to coordinate joint activities of members of different economic sectors, regardless of their production and business scale, assisting one another to improve value, quality and compatibility of Vietnam's sea products. On the other hand, NAFIQACEN activities are approved by import countries, such as EU, the US and Japan to inspect the SFCs' sea products before exporting as the first technical barrier.

Figure 1: The structure of Vietnam's SFC organization (*. the number of SFCs)



In particular, the MD is a vital agricultural zone in Vietnam. With a tropical monsoon climate and favourable weather condition, it lends itself very well to the growth of paddy and a wide range of plants and vegetables all year round. Especially, coastal seafood is the most important component of aquaculture in the MD. In addition, agriculture, including aquaculture, plays an essential role in the lives of farm households in the region. New strategies of the government for economic development have encouraged the development of agriculture for the growing economy. Moreover, the region is also well-known for its low and wet land bio-diversity with the *Melaleuca* forest ecosystem in the freshwater areas and mangrove ecosystems by the coasts. Therefore, it shows good natural conditions for aquaculture development. The annual growth rate of aquaculture in the MD has been estimated to be higher than 10% compared to about 6% for the country as a whole. Aquaculture in the MD, therefore, was considered to have a vast potential for aquaculture development in the future (*Ministry of Fisheries, 1995 and 2000*).

Moreover, the decline in rice cultivation and the increase in the role of aquaculture represent an important structural change in the economy in the rural areas of the region in recent years. Therefore, more consideration and support is expected to lead to development of small-scale aquaculture (*Ministry of Fisheries, 1996 and 2000*). In fact, there are 954,356 ha of inland water reserves, of which 344,320 ha are in the fresh water areas, excluding the area of rivers. It was estimated that about 50.3% of the total water reserves are suitable for aquaculture. Especially, shrimp culture, mostly bred in the MD, is a special and important type of farming. Traditional shrimp culture has been conducted in this region for years, but rapid development of shrimp culture started from the end of the 1980s, later than other neighbouring countries such as Thailand, the Philippines, and Indonesia. Specifically, the MD has contributed over 50% of the total aquatic volume and 60% of exported aquatic value of Vietnam. It contributed 75-80% in terms of shrimp culture areas and 85-90% in terms of production output during the period of 2000-2003. In 2002, the MD's shrimp export value accounted for 89% of Vietnam's total exported shrimp value (*Ministry of Fisheries, 2003*). Ca Mau, the most Southern province of Vietnam, is the leading province, not only in culture area, but also in production output (*figure 2*).

However, the rapid and spontaneous development of shrimp culture has resulted in technical and environmental problems, and has created some serious socio-economic issues. Many of these issues stem from serious shrimp disease outbreaks in the MD since the end of 1993. These have affected quantity, quality and grading (size) of shrimp that determine the export volume and value to the global markets, both in the short run and in the long run.

In addition, the MD's companies lack conditions and methods to control the product quality in their supply chain and other processes in recent years. As a result, the MD's seafood products in general and shrimp products in particular were contaminated by antibiotic, microbiological and other contaminants. This has led to refusal or even destruction of products by countries with strict import market standards, such as the EU, the US, and Japan. These markets require the exporters of seafood products to assure hygiene and safety to the consumers. Contamination could have occurred anywhere from upstream to downstream in the supply chain – primary production, transportation, processing, warehousing, inventory, facilities, technology, packaging, and distribution.

As of 2002, the MD has 87 SFCs in the MD (41 SOEs, 14 corporations, 28 private companies, 1 joint venture company and 3 foreign companies) located in its twelve provinces. There are a total of 52 SFCs that have been in business for over a year, of which 34 are SFCs exporting shrimp and other sea products. Also in 2002, seven of the ten leading export SFCs are located in the MD. Together, they obtained US\$ 638.433 million of the export value (31.56% of Vietnam's total seafood export value – *table 1*).

Table 1: Top ten export SFCs in 2002

No.	Name of SFC	Exported volume (tons)	Exported value (\$US million)
1	*Kim Anh Ltd.	9,114	102.160
2	*Minh Phu Ltd.	8,770	100.160
3	*Fimex Vietnam Co.	7,093	77.618
4	*Camimex Co.	7,801	73.167
5	*Cafatex Co.	7,500	62.000
6	Cofidex Co.	6,420	58.055
7	*Seaprodex Minh Hai Co.	4,500	45.500
8	*Kisimex Co.	31,312	45.000
9	Seaprodex Da Nang Co.	5,200	37.540
10	HCMC Fisheries Trading Co.	10,250	37.025

Source: www.vneconomy.com, Vietnam economic times 25/6/2002

Note: (*) SFCs from the MD

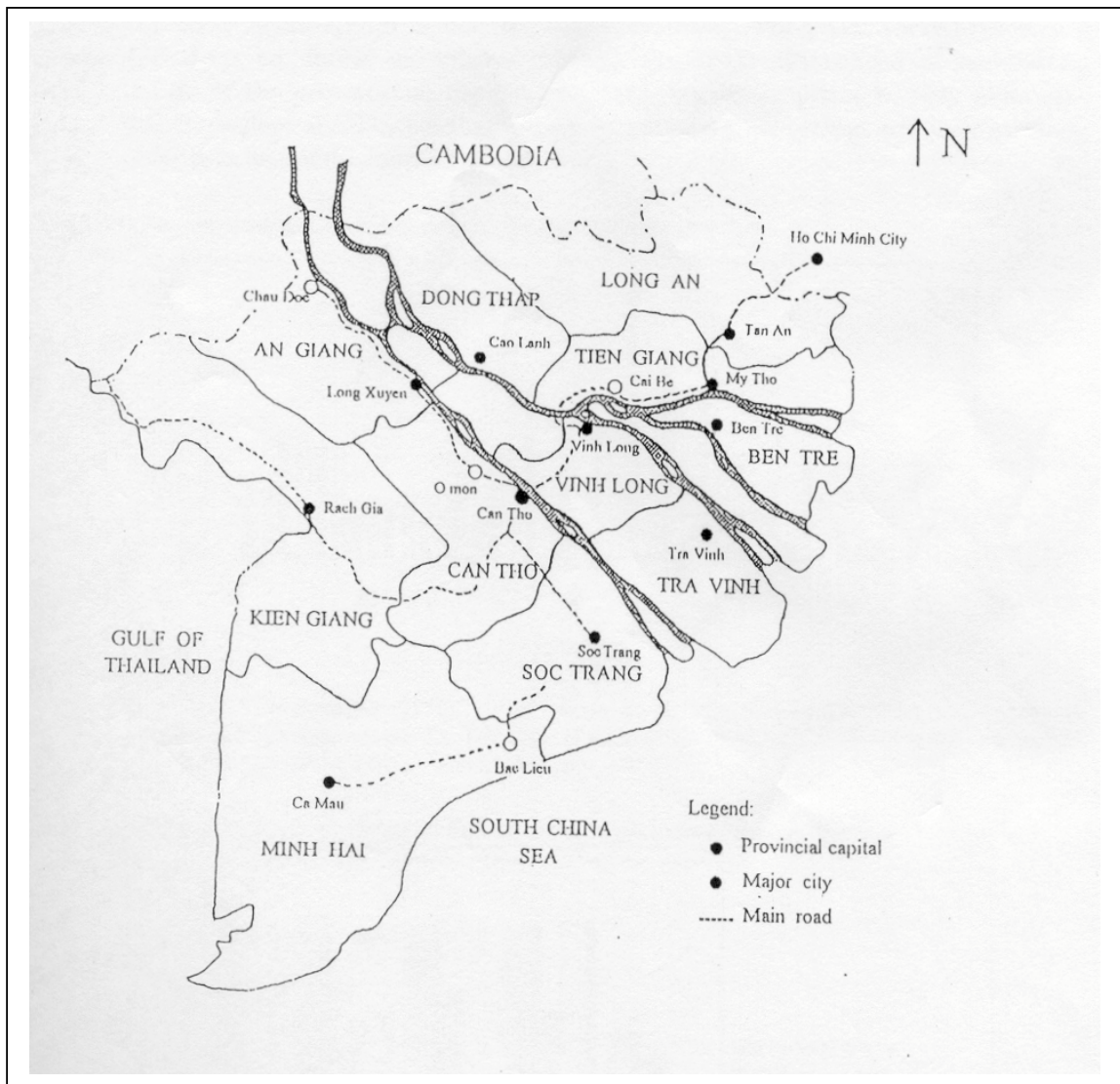


Figure 2: The Mekong Delta Map

2.2 Research results of 94 SFC's in Ho Chi Minh City

According to the research results on “The measures for Vietnam seafood export markets” at 94 SFCs in HCMC (Ho Chi Minh city) (2001) conducted by Thanh Thu, the main problems relating to the export markets of the SFCs are :

- (1) Very strict market standards on seafood safety and hygienic condition
- (2) Lack of market information
- (3) Weak marketing
- (4) High transportation costs
- (5) Low export price
- (6) Lack of “clean” raw materials
- (7) Poor valued-added products
- (8) High manufacturing cost
- (9) High competition
- (10) High import taxes

Generally, the largest problem of the seafood companies in HCMC is that their products sometimes failed to meet the strict requirements on seafood safety and hygiene set by the US, the EU, Japan, Canada, Australia and other countries. Following are the result of SWOT analysis (Bobette Kyle, 2000) conducted by Thanh Thu relating to the seafood import markets of Vietnam.

- *SFCs' export to the US market:*

Strengths (S)	Opportunities (O)
1. High growth rate of export value and volume 2. Fast development of aquaculture 3. 75 SFCs applied HACCP 4. Diversification of Vietnam's seafood	1. Reduced tax for some seafood products after Vietnam-US trade agreement 2. High consumption
Weakness (W)	Threats (T)
1. Lack of US market information 2. Backward processing technology 3. "Raw" products with low price 4. Unstable raw materials	1. High competition with Thailand and Canada products 2. Strict quality control

- *SFCs' export to EU market:*

Strengths (S)	Opportunities (O)
1. More SFCs exported their products to EU market 2. High quality product 3. Diversification of Vietnam's seafood	1. High potential need of aqua products 2. Beef and sheep crisis in EU
Weakness (W)	Threats (T)
1. "Raw" products with low price 2. Low growth rate of export volume and value 3. Backward processing technology 4. Passive behaviour with market information 5. Unstable raw materials 6. Weak marketing	1. High competition with products from Thailand, India, and Bangladesh 2. Very strict quality control (zero-tolerance) 3. EU concessions to other poor countries

- *SFCs' export to Japanese market:*

Strengths (S)	Opportunities (O)
1. Vietnam's largest seafood export market 2. High quality of Vietnam seafood in Japan market	1. Low import tax than competitors (most-favoured nation regulation) 2. Good co-operation on production and trade
Weakness (W)	Threats (T)
1. Low export value (raw products) 2. Weak marketing 3. Lack of consumer information	1. Lack of differential trade mark 2. Low competition with India and Thailand's 3. High competition between Vietnam SFCs

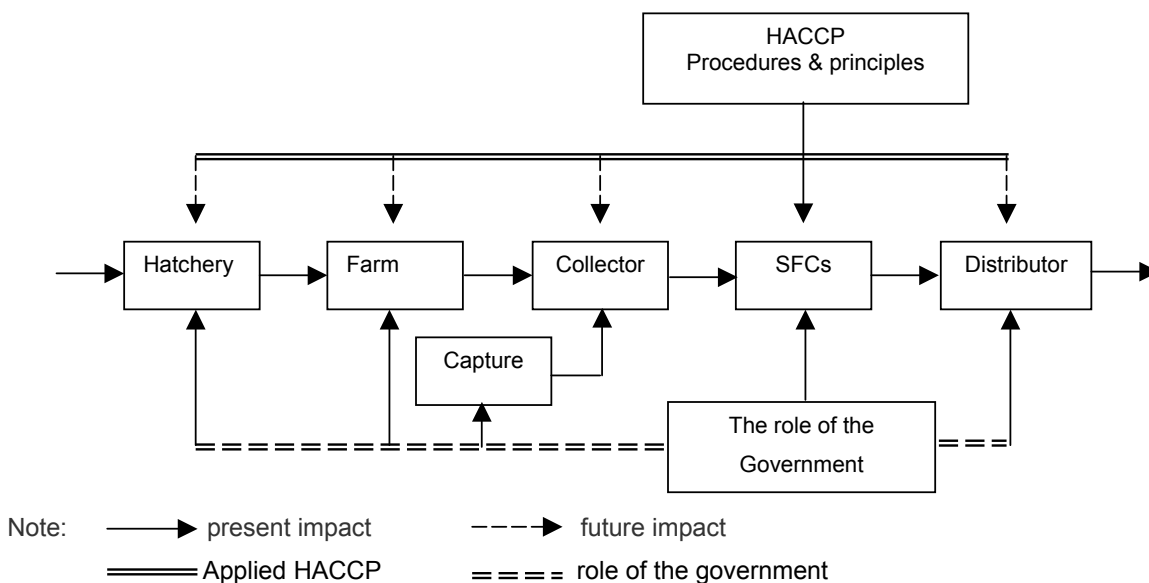
2.3 Discussion of the survey results of quality problems in the shrimp supply chain quality in the MD (see appendix 2 for details)

Recognition of the importance of the HACCP standards in food control and safety of the food chain in international trade is an urgent task of the Ministry of Fisheries, the local governments and the seafood companies in Vietnam in recent years. The shrimp supply chain in the MD includes five stages –

hatchery, farm/capture, collector, the SFCs and distribution (*figure 3*). However, according to the survey results of 32 SFCs in the MD, only the SFCs in the chain have applied the HACCP. Other stages of the chain are supported by the Vietnamese government for improving and assuring the quality of seafood products. As a result, there were approximately 38% of the interviewed companies whose products were refused by the customers due to antibiotic infection (chloramphenicol) and other contaminants in 2002. Moreover, Vietnam's seafood has been warned weekly by the US and EU markets for infection by contaminants during in the course of 2003.

Regarding the hazards happened through the chain, 25% of the companies said that their products were infected by microbiological hazards (*E.coli*, coliform, and salmonella). Similarly, 15.6% and 9.4% answered the products to be infected by chemical (chloramphenicol and sulphite) and physical hazards (pieces of metal), respectively. Particularly, in the shrimp purchasing process the companies have controlled the temperature and hygienic condition of the equipment, but they could neither control and audit the level of antibiotic infection, nor the ice hygiene, although they have a good relationship with the suppliers. Both the companies and suppliers lack equipment to detect the hazards. In processing, almost all of the SFCs (96.9%) have actively controlled the hazards in shrimp procedures - shrimp material receiving, handing, classification, frame, freeze, ice-plated, metal check, packaging and storage. Following is a detailed discussion of the shrimp supply chain quality in the MD.

Figure 3: Application of HACCP and role of the government in shrimp chain in the MD



2.3.1 Hatchery production

Almost all 900 hatcheries in the MD are small-medium sized and managed by the private owners (95%). The hatcheries' activities are simple - low construction and operation costs, and low-technical inputs. The operations are flexible depending on the season and supply of wild seed. This type of hatchery often has disease and water quality problems, but it is easily and quickly disinfected and reopened without serious losses. Some hatcheries have large tanks used, low stocking densities, and low rates of water exchange.

According to the research of Sinh (2002) since the beginning of the 1990s, shrimp propagation research in the MD has been focused on the maturation of *P. monodon* brood stock, which is considered the bottleneck for shrimp hatcheries and farming in MD. Artificial *P. monodon* post larvae were imported from the Central region to overcome this bottleneck. The import of post larvae from the Central region has thus been a major source of shrimp seed for the grow-out activities in the region. About 900 hatcheries in the MD provided 3,877 million post larvae, equal to 18.9% of the total number of shrimp seed purchased by the shrimp grow-out farms in the region at the same time. According to provincial Departments of Fisheries Source Protection, there is approximately 20%-50% of total shrimp seed sold in the market that are inspected for origin and disease. However, the inspection is simple by perceptivity, so shrimp seed from uncontrolled sources is popular in the region that have affected yield and shrimp quality at the farms.

In order to manage shrimp seed better, there were several regulations and policies of the government concentrating on hatchery development in order to provide high shrimp seed quality and quantity, but the effectiveness was low. For example, regulations on the protection and conservation of natural aquatic resources were issued by the Ministry of Fisheries in 1987. The regulations on the production of shrimp seed and the nurseries for post larvae from PL12 to PL35-45 have been implemented since 1998 (Ministry of Fisheries, 1998). However, the management of post larvae quality and trading has not improved. There is a lack of 'high-tech' checking methods and facilities in association with the problems caused by a special transportation network (Ministry of Fisheries, 2000-2003).

Then, the policies and regulations set by the government have been changed so as to accept imported shrimp brood stock and shrimp seed from neighbouring countries. In 2002, a total of 10,919 shrimp brood stock were imported from Singapore, China, Myanma and Australia. However, 2,668 shrimp died immediately after reaching Vietnam due to various reasons. The importation of a diversity of shrimp species is being given consideration along with the importation and artificial propagation of *Penaeus vanamei*. From 2003, production of about 3 billion post larvae of this species is expected per year, of which 2 billion in the Central region, and 1 billion in the MD (Ministry of Fisheries, 2003). The demand for shrimp seed may vary for many reasons. The changes in the international market for shrimp products is particularly variable, and the level of intensification of shrimp farm development, as well as the success of both shrimp seed production and breeding activities can change rapidly over time.

Ministry of Fisheries (2001) explained that at the beginning of 2001, around 110,000 ha of rice fields were converted into rice-shrimp areas in the coastal provinces of the region, mainly in the provinces Ca Mau, Bac Lieu, Soc Trang, and Kien Giang. But crop losses were observed in 50%-70% of these areas in the first crop of the year with about 3 billion shrimp seed being washed away. This was thought to be due to a low level of shrimp seed quality and technical skills, as well as unsuitable conditions in the new ponds. The large increase in the cultured areas and the big losses of shrimp seed has raised the demand for shrimp seed. This increased the risks in shrimp production, since pressure is placed on the quantity and quality of the shrimp seed supplied. However, the development of the shrimp industry strongly depends on the quantity and quality of the shrimp seed supplied. Many at-

tempts have been made by different institutions to improve both shrimp seed production and grow-out, but the results are still varied and risky.

In short, improvement of quality of larvae depends on the quality and the reproductive capacity of shrimp brood stock, as well as a number of other factors relating to the stocking of brood stock and the rearing of larvae in the shrimp hatcheries. There are several methods designed to check the quality of post larvae before buying and stocking them into the breeding ponds. Quality testing of post larvae using the Polymerase Chain Reaction Method (the PCR test) has become very important to the intensive breeding farms beside the government's support in management and quality assurance of shrimp seed.

2.3.2 Farm production

There are three typical practices of shrimp grow-out farming in Vietnam as well as in the MD. They are extensive, semi-intensive and intensive systems (*see appendix 1*). These three farming systems were applied to 80%, 15% and 5% of the total shrimp culture areas in 1995, respectively (Rosenberry, 1996). The Ministry of Fisheries (2000) showed that these percentages were similar in 2000 - 81.2%, 17.5%, and 1.3%, respectively. At present, the integration of mangrove-shrimp and rice-shrimp farming, and improved extensive mono shrimp practices are common in the MD.

The farmers, who produce shrimp materials to sell their products to the SFCs, include two groups – free farmers (their shrimp sold to the collectors) and fixed farmers (their shrimp bought at the spot by the SFCs). All farmers are supported by provincial extension centres where the farmers can be helped with shrimp breeding techniques. However, the SFCs cannot assure the quality of the shrimp product from both free and fixed farmers as the shrimp quality is affected by many factors, apart from culture techniques, such as shrimp feed, veterinary and environmental hygiene that are not among the responsibilities of the extension centres. In contrast, fixed farmers include both the farmers who are selling their shrimp to the SFCs and the farmers (21.5%) who are invested by the SFCs. Although bred shrimp from fixed farmers are controlled by extension staff or technicians or both of them, the hazards cannot be eliminated from the products because the staff/technicians cannot control diseases of shrimp seed and the residues of antibiotic that are not allowed to use in shrimp feed and veterinary. Besides, a polluted breeding environment and limited farmer's quality awareness are important factors that cause chemical hazards to the shrimp materials directly or indirectly (*appendix 4–figure A1*).

Specifically, shrimp disease outbreaks in the MD have been occurring since the end of 1993 due to many factors. The main causes are a lack of suitable planning; low levels of technical and farm management knowledge; degradation of the environment, especially water quality, deforestation of mangrove forest; and a poor supply of shrimp seed in terms of both quantity and quality. For the period 1994-1999, only 20-30% of farms were successful in shrimp culture (Truong and Tham, 1996; Ministry of Fisheries, 1995, 1997, 1999 and 2000; Sinh and Binh, 1996). At the beginning of 2001, about 110,000 ha of rice fields in Soc Trang, Bac Lieu and Ca Mau provinces were converted into rice-shrimp areas, but 50-70% of these areas lost the first crop of the year. Shrimp production has become a sector with high levels of risk. In order to obtain satisfactory outcomes, a number of things need to be improved, especially a better supply of shrimp seed in terms of quantity, quality, and the timing of

supply. Many experiments have been conducted, including studies on the diversity of species, but the results have not been clear and production remains risky. In 2002, diseases occurred on 74,128 ha accounting for 27.6% of the total cultured areas or 268,854 ha of the region (Ministry of Fisheries, 2001-2003). As a result, lots of different antibiotic and other medicines used that have affected quality of raw shrimp materials.

In addition, in recent years the Vietnamese government has played an important role in encouraging and promoting quality assurance of sea products from primary production to distribution. In primary production, the government has issued lots of policies and regulations related to fisheries safety and hygiene, environment protection, development of fisheries culture areas, used level of antibiotic, veterinary and other medicines for fisheries safety, etc.. However, the effectiveness of these policies and regulations have not been evaluated highly, because the implementation of the government programmes and policies have not been done synchronously by the local governments, Departments of Fisheries, Departments of Agriculture and Rural Developments among the provinces in the MD. Today, the role of extension staff is very important in supporting the farmers with breeding techniques, breeding environment protection, even propagation of the government policies and decrees relating to fisheries safety and sustainable development, as well as instruction of implementation. But, demand for extension staff in the MD is now much more than its supply, both in terms of quantity and quality, and the number of experienced staff is very limited, so that the requirements of fisheries development can not be effectively met.

Regarding marine catch of fisheries, after a period of rapid growth in the late 1980s and the early 1990s, the fishing industry experienced a downturn due to sagging efficiency: the yield of fishing boats which was, on average, 0.92 ton/horsepower in 1990, came down to 0.62 ton/horsepower. This was due to both objective factors (inshore fishing has exceeding the permissible catch norm by 10%) and subjective factors (backward machinery and equipment, lack of means and experience in high sea fishing, poor qualifications of the work force, etc...). In recent years, all offshore fishers are supported by a concessionary loan policy for equipment and boat investment to increase captured productivity, but the amounts involved are limited. Also, the offshore fishers lack techniques and equipment for raw materials storage. Particularly, although shrimp materials from offshore are seldom infected by the hazards, storage techniques and equipment, quality knowledge as well as long storage time offshore, are the main factors affecting shrimp materials.

2.3.3 Collector

According to the survey, there are approximately 61.8% of input shrimp materials of the SFCs bought from the collectors. The collectors' activities are simple, i.e. buying, storing and transporting shrimp to the SFCs (maximum 3 days), but affect much shrimp quality according to the SFCs' leaders interviewed. Capital, maintenance techniques and means are main factors in the collectors' activities. The collectors' capital used to buy shrimp materials is from three sources – of collectors themselves, from loans and from the SFCs. Some SFCs can provide the money in advance to the collectors to buy shrimp materials (a method to keep collectors' loyalty to the companies). However, the supplier's capabilities themselves are limited – a lack of capital, quality awareness and equipment to inspect and maintain shrimp materials, and a low education level to understand and apply quality knowledge. Par-

ticularly, they do not seem to understand importance of quality of their products in relation to the quality of the final products traded in the world market, and have used chemical and other substances to maintain shrimp materials before selling them to the SFCs (*appendix 4-figure A2*). Regarding inspection of input shrimp, both the company and the collectors only use their own perception to inspect shrimp materials. That is, of course, not enough to discover the hazards. According to the companies interviewed, they were concerned much more with quality requirements of shrimp materials, because there were approximately 56.3% of total shrimp materials assessed in good quality, thanks to good a supply source of shrimp.

Specifically, the collectors themselves are a major factor degrading the quality of shrimp, by their adding of chemical substances, edible seaweed, shrimp meat or nails to keep shrimp size and weight before transporting them to the companies. Besides, there is high competition in buying raw shrimp in the MD to supply raw shrimp for the SFCs in the region as well as out of the region, like HCMC. In fact, the SFCs in the MD have themselves used some policies to keep collector's loyalty and shrimp quality, especially price promotion policies and payment in advance. Therefore, in order to improve the collector's shrimp quality, the SFCs play a very important role in terms of instruction of maintenance techniques, quality awareness, even participating in collector's operations to audit and inspect the shrimp material. Also, it is necessary to have support from the government, both financially (loans) and in punishing cheating from the side of the collectors.

Shortly, nobody (the government, extension centre, the farmers, the collectors or the companies) can assure 100% of quality of shrimp materials free from diseases, hazards and other contaminants, even for shrimp bred using capital sources invested by the company with strict control and inspection of extension staff and technicians. The reason is that shrimp diseases from shrimp seed, as well as banned residues from feed and veterinary cannot be eliminated.

2.3.4 Processing

In general, the companies did not satisfy quality requirements of shrimp materials because, firstly, their plants are located far from sources of shrimp materials, and secondly, they are lacking the conditions to control quality of shrimp materials. The SFCs realized that quality of shrimp materials is a very important factor that affects to quality of finished products. Therefore, the company's reputation in terms of business success and flexible price policies (43.8%) and quick payment (50%) are important elements that the SFCs have used to maintain the suppliers' loyalty. Besides, almost all SFCs in the MD are in a cut-throat competition of buying shrimp materials (93.8%) with internal and external SFCs of the region. As a result, uncontrolled shrimp materials are still distributed in the MD popularly.

In shrimp processing, the hazards can occur in any stage, from receiving shrimp input to distribution. According to the interviewees, the factors that affected the final shrimp quality in processing are (1) the quality of shrimp materials (81.3%); (2) the storage process (50%); (3) processing technology (56.3%); (4) processing techniques (68.6%) and (5) inventory time of finished products (53.1%). To keep the final shrimp products free from the hazards and assure hygiene, safety and quality, HACCP procedures and principles are crucial tools to apply. At present, the SFCs in the MD have imple-

mented prerequisite programmes before applying the HACCP, such as GMP and SSOP, as well as other issues related to initial changes of management and human resource. However, according to the survey, although 96.9% of the SFCs applied the procedures and principles of HACCP, these are not implemented completely inside the company, for reasons relating to a lack of capital to invest modern technology and test equipment; lack of experts or specialists who have high capabilities and skills in quality management, supply chain management as well as capabilities of statistical knowledge, a low employees' quality awareness, especially unchangeable organization for quality behaviour. Also, other international standards have been applied - 6.2%, 34.4%, 31.3% and 6.3% applied TQM, ISO, SQF and BRC, respectively. As a result, final shrimp products are not completely free from hazards (*appendix 4-figure A3*).

Specifically, almost all companies in the MD (96.9%) established an HACCP team. According to the organizational structure of each company, the team includes a quality control specialist (78.1%), a production specialist (71.9%), an engineer (71.9%), a member of the management (43.8%), and one of other specialists (buyers, operators, packaging experts, distribution experts, or hygiene managers). The responsibility of the team is to describe the product and its distribution, such as composition and physical features of the final product (87.5%), process information (production methods used – 81.3%), method of packaging (78.1%), required shelf life (87.5%), storage and distribution conditions along the chain (81.3%), legal product requirements (71.9%), and instructions for use and storage by consumers (68.8%). Besides, only 10% of the SFCs have identified intended use and customers. In addition, there were approximately 87.5% of the companies that have developed process flow diagrams. They have saved typical data to draw the diagrams on the internal computer system. The data included (1) all raw materials/ingredients and packaging used (65.6%), (2) time/temperature history of the chain (71.9%), (3) processing conditions (68.8%), (4) storage and distribution conditions (68.8%), (5) product loops for recycling or reworking (37.5%), (6) routes of potential cross-contamination (62.5%), (7) high/low risk area segregation (62.5%), (8) overview of floors and layout of equipment (62.5%), (9) features of equipment design (46.9%), (10) efficacy of cleaning and disinfection procedures (65.6%), (11) personal hygiene practices (75.0%), and (12) consumer-use instructions (65.6%). However, there were only 87.5% of the SFCs that have inspected the process and verified the flow diagrams.

Regarding the Critical Control Point (CCPs), these that 71.9% of the SFCs are most concerned about is input shrimp materials, followed by shrimp processing (59.4%), and the packaging process (56.3%). The reasons for determining CCPs are that hazards have often occurred at these processes. In addition, the companies have also established critical limits for these CCPs – 71.9% of the SFCs have established critical limits to control microbiological hazard, and 84.4% and 81.3% for chemical and physical limits, respectively. However, the companies have only established procedures just to monitor critical limits, i.e., they did not have clear procedures regarding “What to monitor? Why to monitor? How to monitor? Where to monitor? Who monitors? And when to monitor?” The procedure is only managed by the quality control head who is unable observe the all processes at the same time. As a result, corrective actions after monitoring were only concentrated in some main processes.

Table 2: The percentage of SFCs with determined CCPs

Contents	% the SFCs with determined CCPs
1. Purchase of raw materials	71.9
2. Shrimp material receiving and handling	43.8
3. Shrimp processing	59.4
4. Packaging	56.3
5. Storage	18.8
6. Distribution	3.10

Source: Survey result

Moreover, most of interviewed companies have established effective record keeping systems, such as CCP records (96.9%), critical limit records (96.9%), records associated with deviations (90.6%), records and verification (100%), records review and retention (90.6%), and regulatory access (93.8%). Particularly, the establishment of procedures for the verification that the HACCP system is working correctly, has depended on each SFC's conditions. The results of the interviews showed that 81.3% the SFCs have applied prevention procedures, CCP verification (87.5%), and HACCP programme verification (87.5%).

2.3.5 Distribution

In distribution quality control, the companies are only able to implement quality assurance in storage and transportation stages in the chain inside the company, because these can be managed and controlled by the company. However, storage conditions are generally not strong and safe enough for keeping the products in terms of quantity and quality (temperature, old warehouse and technology). According to the survey results, the quality of the shrimp final products was affected by storage conditions (50%), of which inventory time (53.1%), and transportation conditions (40.6%) (*appendix 4-figure A4*). Other stages, such as selling, receiving orders, transportation and storage outside the company, buying and consumer usage, have not concerned the company as these are out of the company's control. Moreover, the companies get customers' complaints from foreign agencies not from market information and analysis so far.

Like in other stages of the chain, the government has supported the distribution process by interfering to help the SFCs with respect to customs formalities, as well as the SFCs' representation to have common voice in such issues as import market problems in terms of quality standard level, product labels and product devaluation. However, the effectiveness of the support is still limited due to lack of knowledge and experience in international business negotiations or in business conflicts/cases.

In the future, the Vietnamese government will continue to encourage and promote using appropriate and practical policies and programmes to develop the fisheries industry in a synchronous and full-faceted way. The government is also concerned about feed production – the feed ingredients must assure the growth of fisheries in general and shrimp in particular free from banned residues. In addi-

tion, inspection of HACCP implementation in the company will be conducted and audited by VASEP and NAFIQACEN frequently, with the aim to assure that HACCP procedures and principles are applied completely and effectively at the company level (Ministry of Fisheries, 2003).

2.3.6 Market problems

Some important market problems should be mentioned as follows :

- Lack of consumer information: Today, all consumers have high requirements and expectations on shrimp quality. These are different for the various market segments (various types of products, weight and size). It is therefore not easy to respond to market characteristics and to the customers' needs when they often change their consumption behaviours in the short period.
- Strict control and tests by importers on micro-organisms and antibiotic residues in finished products: Japan, the US and the EU now use new means to test chloramphenicol and other antibiotics in seafood products, with zero-tolerance. So, hundreds of containers of shrimp products from Vietnam and other countries are waiting for being controlled. If a shrimp sample is infected by any antibiotic it will be immediately have effect for the total container. Seafood from China was refused by EU market.
- Other problems regard the sales contract, such as exchange rate, transportation, documents.
- High competition and trade mark conflicts : Vietnam's seafood products face high competition with these from Thailand, Ecuador, and Indonesia in terms of price and quality; Vietnam is not allowed to use the name "catfish" in the US

In summary, the HACCP standard cannot be applied to primary production and supplier level due to the situation with the company, the supplier and the farmers. The company is only able to use suitable policies and knowledge of supplier quality management to encourage and promote the suppliers' loyalty and quality assurance. Similarly, in next coming years the SFCs are unable to manage and control the distribution stage from the ports to the consumers due to their limited capability in market research as well as in the distribution of their products to the final consumers. Therefore, along with the role of the government in improvement of the fisheries product quality, the problems expected to solve in the research related to the shrimp supply chain quality management include supplier quality management (collectors and fixed farmers invested by the companies) and the implementation of HACCP in the processing by the SFCs in the MD.

In the next section a quality framework and measures to improve and assure quality in shrimp supply chain that aims to meet the customer's needs will be presented.

3. Measures for shrimp supply chain quality management (SCQM) in the MD

Based on the survey results, the discussion and the literature review, a SCQM implementation framework is developed. The framework is useful for companies to improve their business performance and the seafood quality in the supply chain. The SCQM implementation framework is designed not only for shrimp products, but for sea products in the MD (it evidently can also be applied by other countries). The framework is also useful for top management officers of the local governments and for people who have a special research concern, such as teachers, students and other in order to refer to stu-

dies, research and applications. Therefore, this section focuses on a feasible framework or guidance for SCQM implementation to improve shrimp product quality in actual quality management practices in the supply chain. The quality framework in the shrimp supply chain mentioned generally includes supplier quality management, quality management in manufacturing processes, especially HACCP application and quality control in distribution process (*figure 4*). Also the role of the government and the support of VASEP and NAFIQACEN are very important and necessary to obtain quality objective of Vietnam's seafood in general and shrimp products in particular in the near future.

3.1 Supplier quality management

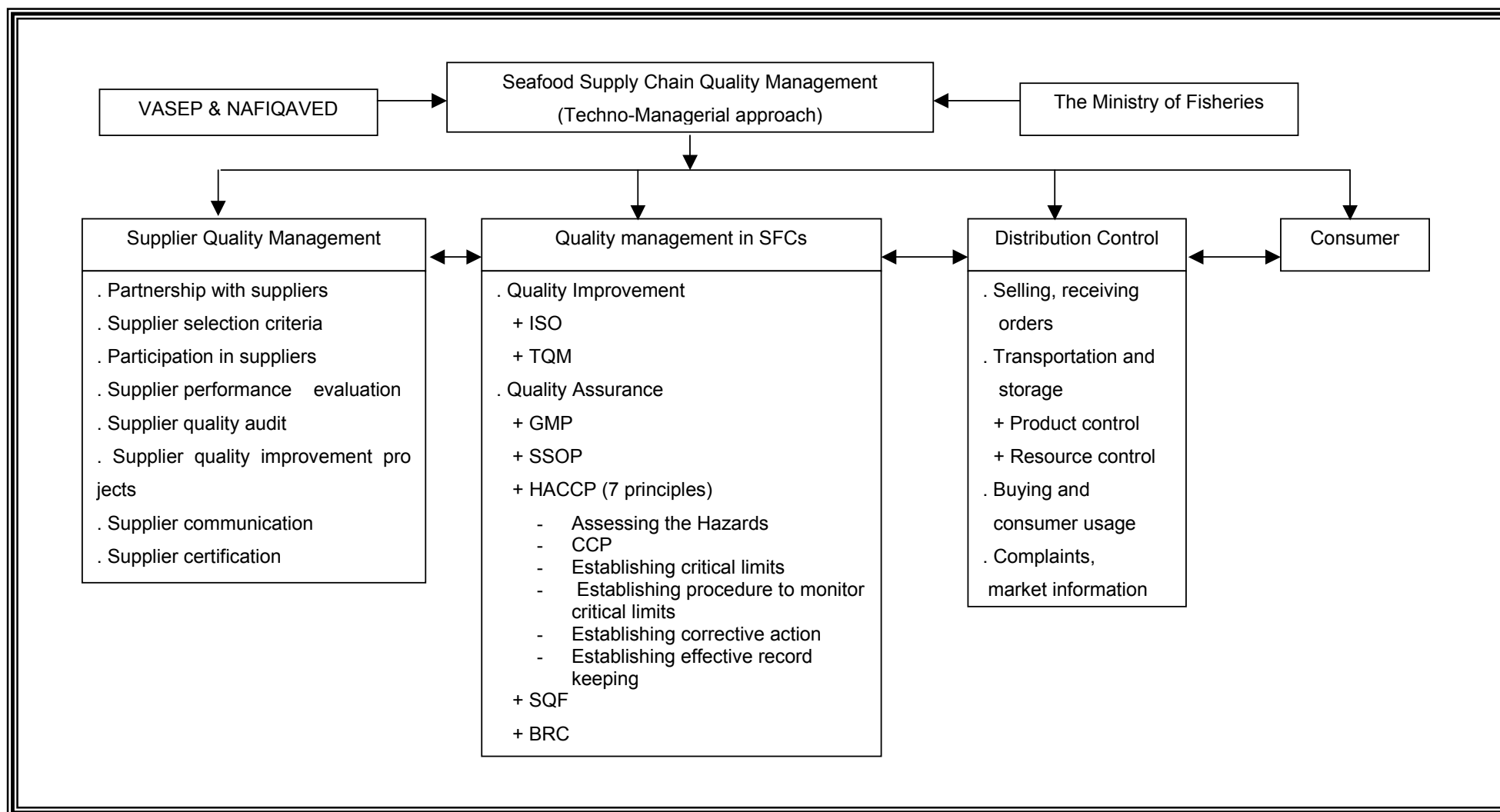
3.1.1 In primary production

The measures for improving shrimp seed quality have been thoroughly researched by some authors. According to Bray and Lawrence (1992) and Callinan (2002), the quality of post larvae should be measured in terms of standards that are accepted in the industry. These standards should be simple to assess, accurate, and replicable. Various measures have been proposed for quality tests such as:

- (1) Pre-spawning parameters for brood stock (sperm and serum which are present in the mated or fertilized states of the brood stock);
- (2) Spawn size or number of eggs per spawn (a poor prediction of larval quality);
- (3) Egg diameter which is good for fish but has not been shown to correlate with viability in shrimp spawning;
- (4) Hatching rate of eggs (40 percent is often used as the cut-off);
- (5) Nauplii phototaxis (movement to light sources);
- (6) Survival rate of larvae at each sub-stage: nauplii, zoea, mysis, and post larvae;
- (7) Deformities;
- (8) External fouling (smell);
- (9) Duration of the embryo development or larval stages (in the units of time);
- (10) Post larvae weight is a sensitive criterion, but not useful when post larvae are big in size, since bigger is not always better;
- (11) Post larvae length applied to post larvae from post larval stage 1 (PL1). This is useful and simple;
- (12) Post larvae stress tests, designed to determine the viability in the grow-out environment (salinity, pH, and formalin);
- (13) Biochemical composition (very hard to apply);
- (14) Post larvae muscle to gut ratio (ratio of diameters which is designed to predict grow-out performance);
- (15) Weight frequency distribution of larvae;
- (16) Disease diagnosis (viral agents and other infectious diseases, etc.).

There are a number of other methods designed to check the quality of post larvae before buying and stocking them into the grow-out ponds. Quality testing of post larvae using the Polymerase Chain Reaction Method (the PCR test) has become very important to the intensive grow-out farms.

Figure 4: Seafood Supply Chain Quality Management Framework



3.1.2 Supplier quality management

At the company level, the research is expected application of the HACCP standard as a norm through the chain - from primary production to distribution - to cover quality problems. However, HACCP plans may not need to be developed on an individual basis for primary producers but may be developed by experts and recommended to primary producers as "good practice recommendations". Education and training programmes should be relied upon to introduce practices that, in effect, may represent a change in the manner in which farms and other primary food production operations are managed (FAO, 1998 and Jongen, 2002).

Particularly, the MD's shrimp chain characteristics in primary production are different from other products like fish, vegetable and animals. Shrimp is cultured in a very large scope and spread in the whole region. In addition, it is difficult for the farmers to follow quality knowledge because they have low education levels and lack capital and equipment to control. Therefore, in order to improve the quality of primary producers mentioned in Figure 4.2, the role of the government is very important. The government not only needs to issue policies and regulations related to environmental and fisheries hygiene and safety, but to manage and control them effectively. Specifically, local governments need to guide/instruct primary producers and to establish regulatory control programmes to ensure food safety and wholesomeness at the primary production level. To do this effectively, provincial extension centres and departments of agriculture and aquaculture are important support channels in terms of training, implementation instruction and inspection. Nevertheless, Jongen (2002) mentioned that hazards associated with primary production may or may not be eliminated or reduced to acceptable levels depending on the subsequent processing and handling of the primary food products. Therefore, supplier quality management is a good tool to assure the product quality instead of the HACCP implementation in the MD. However, the companies cannot have this method used by all farmers but only by those in which they have invested capital to get high quality of shrimp.

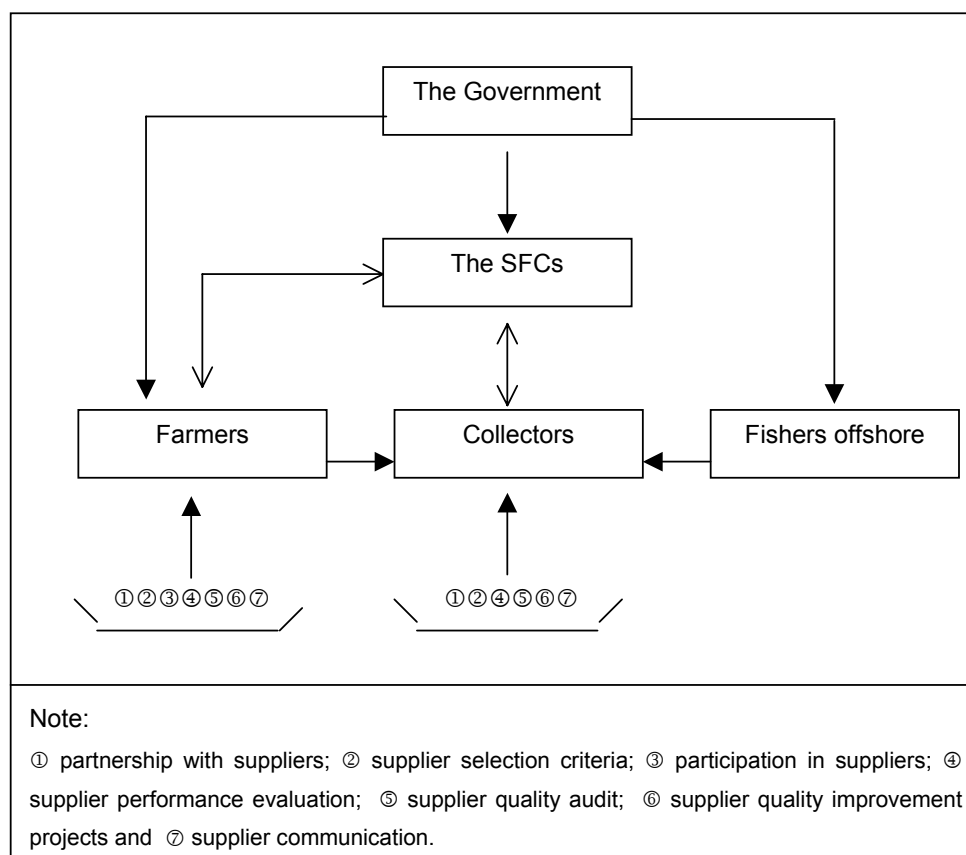
As hatchery production takes place independently from the SFCs, quality assurance of shrimp seed depends on the techniques of shrimp seed cultivation and the managerial level of both the hatchery itself and State management (the role of the government in quality management in primary production) and control of imported shrimp seed source. Therefore, it is necessary to establish large scale hatcheries, owned by the State or the private sector, with sufficient investment in technology and human resources, including high managerial training, that aim at improving and assuring the quality and quantity of shrimp seed demand.

Regarding quality problems of shrimp in the collector's stage (figure 4.3, p.64), the SFCs can use the various aspects of supplier quality management to improve shrimp quality of their suppliers. These aspects include (1) partnership with suppliers; (2) supplier selection criteria; (3) participation in suppliers; (4) supplier performance evaluation; (5) supplier quality audit; (6) supplier quality improvement projects and (7) supplier communication. Figure 5.2 indicates that shrimp materials from offshore fishermen are collected by wholebuyers/collectors (100%). Farmers, however, can sell their aqua products directly to the SFCs, or indirectly to the collectors. In average, the SFCs in the MD can buy shrimp raw materials from the farmers directly (16.7%), collectors (61.8%), and from their invested

companies (21.5%). Based mainly on shrimp quality issues of the suppliers, the supplier quality management framework is developed to improve their product quality (figure 5).

It is noted that the farmers and collectors mentioned in the figure 5 are stable supply sources of raw shrimp of the SFCs. Therefore, the SFCs can use aspects ① to ⑦ (Figure 5.2) in order to improve their sea product quality in general and shrimp in particular. However, participation in the collector's activities (content ③) are not easy for the companies, as it takes time and expenses.

Figure 5: Supplier quality management framework



Apart from common characteristics of primary production of aqua products, aquaculture faces some typical quality affecting factors, such as use of medicine for growth and disease treatment, feed breeding conditions and techniques, and field hygiene conditions, which are important quality factors and should be controlled. Another typical aspect of aquaculture involves feeding production, the quality of which is, however, difficult to control due to very complicated ingredients beyond the know how of the seafood company'.

3.2 Quality management in manufacturing processes

Due to the reasons mentioned above, it is not easy for the SFCs to perform quality improvement without the support of the Vietnamese government (only 6.2% and 34.4% of the SFCs in the MD are applying TQM and ISO, respectively). The reasons are found in the SFCs themselves in the MD, especially state-owned enterprises (SOEs) who depend on organizational mechanisms of the government, and are not sufficiently knowledgeable and competent to change organizational issues, especially

functional structures as well as research and development. In contrast, private companies can decide about everything related to their organization, such as investment for research and development, personnel and other relevant issues. Their organizational structures are simple but effective – less functional departments than the SOEs, very flexible communication and co-ordination between different functions, and quick decision making. However, most of the seafood private companies in the MD are lacking capital to develop new technologies and invest in equipment or research and development in order to improve their product quality. Therefore, they are always in severe competition with others, even SOEs, with the exception, however, of Minh Phu and Kim Anh companies who show enough conditions to apply international quality standards. According to the survey results, the quality system in the SFCs is continuously being improved in terms of using ISO 9000 as a guideline for establishing quality systems, clear quality manuals, clear procedure documents and clear working conditions, be it at a low level.

In contrast, quality assurance is a feasible measure apart from quality planning and control, to improve the sea product quality in manufacturing processes of the SFCs in the MD. Currently, quality assurance programmes, such as GMP, SSOP, SQF, BRC and especially HACCP, focus on food safety issues in general and seafood in particular, but the general principles of HACCP are also applicable to the management of product quality in a wider sense. In the research, the HACCP programme is expected to be used as a main tool to assure shrimp quality free from the hazards in the SFCs. So far, the SFCs in the MD have not successfully implemented the HACCP system yet because they lack financial conditions specialists to implement sufficiently the HACCP system as well as control managerial, organizational, technological and human issues. Especially, their employees are used to top-down decision-making and are not responsible for the quality of the finished product. They also lack quality awareness and management due to a low education level. Moreover, according to the survey results, there is not any manager, who is regularly trained on quality management, including in the HACCP team. Although the SFCs' managers understand the importance of the HACCP standard for their products sold in foreign markets, they lack awareness of the benefits and costs of HACCP.

According to the revised document of NACMCF (1998), an HACCP system should be built on a solid foundation of prerequisite programmes. These programmes are often accomplished through application of e.g., Good Manufacturing Practice codes (GMP) or Food Hygiene codes (FH). These programmes should provide basic environment and operating conditions necessary for the production of safe and hygienic food. Prerequisite programmes include facilities, a cleaning and sanitation programme, training, traceability and recall programmes, and pest control. All these prerequisite programmes must be documented and audited on a regular basis. In fact, almost all SFCs in the MD have performed prerequisite programmes (GMP, SSOP, SQF) with different levels, depending on each company's conditions to apply HACCP.

Application of HACCP (*see appendix 3 for details*)

According to the survey results, although almost all SFCs in the MD have applied HACCP programmes, only parts of the HACCP principles and procedure have been applied. Therefore, HACCP is here mentioned as a main subject for developing hygiene codes at the SFCs based on the HACCP principles and procedure.

- (1) Assembling the HACCP team
- (2) Describing the product and its distribution
- (3) Identifying the intended use and consumers
- (4) Developing a flow diagram
- (5) Verification of flow diagram
- (6) Conducting a hazard analysis (*principle 1*)
- (7) Identifying CCPs (*principle 2*)
- (8) Establishing critical limits for each CCP (*principle 3*)
- (9) Establishing a monitoring system for each CCP (*principle 4*)
- (10) Establishing a corrective action plan (*principle 5*)
- (11) Establishing a verification procedure (*principle 6*)
- (12) Establishing record keeping and documentation (*principle 7*)

In order to improve and assure the quality in the shrimp supply chain, besides applied quality standards, other changes relating to organization, management, technology, training and human resources are very important for efficiently and effectively obtaining quality management in seafood supply chain. Furthermore, State management as well as management of local governments is important through policies, regulations, decrees, etc. with respect to quality assurance and improvement throughout shrimp supply chain and capital loans. The same holds for support of VASEP and NAFIQAVED for quality training, quality inspection, customer and market information, international negotiations and trade, which are necessary conditions for assuring good quality in shrimp products free from the hazards and other contaminants to meet customer's needs (appendix 5-figure A5).

3.3 Distribution control

Distribution control involves the management of flow materials from manufactures to customers and from warehouses to retailers. It also includes the storage and transportation of products. Quality control in distribution management concerns decisions about transportation and storage of products and measuring the whole process, including consumer usage of the products. The steps of distribution control include product and resource decisions, such as selling and receiving orders, transportation and storage, buying and consumer usage, and complaints, market information and analysis.

Based on the actual situation of the SFCs in the MD, the research only focuses on distribution control, transportation and storage; other steps are out of the company's control. Moreover, aquaculture depends on the season, which greatly affects storage and transportation in the whole chain. According to the interviewees, the factors affecting the product quality in the distribution process are transportation equipment (34.4%), transportation time (21.9%), storage equipment (31.3%), and inventory time (53.1%).

In food distribution, transportation and storage can be complex processes within a long supply chain. Product control during transportation and storage concerns quality of the products by monitoring the product and taking corrective action when necessary. Resource control involves transportation equipment, distributor organization and storage conditions. In food industry, temperature and humidity conditions are very important control parameters, as well as hygienic conditions.

4. Conclusion

Although the SFCs have been supported by the government in terms of priority of loans to invest in modern processing technology and equipment, and by VASEP's and NAFIQACEN's support in quality education and training, market information and inspection of final products before exporting, their shrimp products are always in trouble in import markets such as the EU and the US, due to infections of the hazards. In fact, along with the support from the government, the SFCs need to implement and follow strictly HACCP programmes as well as other standards, to improve their final products in order to meet market requirements and expectations. However, in the short run the HACCP standard cannot apply to primary production and the supplier level in the MD, due to limited capabilities in the companies, suppliers and the farmers. Companies are only able to use suitable policies and knowledge of supplier quality management to encourage and promote the suppliers' loyalty and quality assurance. Similarly, the SFCs cannot manage and control the distribution stage from the ports to the consumers in next coming years, due to the company's limited capability in market research, as well as distribution of their products to final consumers.

Food safety has become an issue of critical importance to all food businesses in recent years with several examples of food safety incidents highlighted in the media. This has increased public concern regarding the safety of food supply in general and high-risk products like shrimp in particular. Consumers and governments are demanding safe food, and these demands are being passed back along each step of the food supply chain, ultimately ending with the food producers. It is important to recognize that quality systems, and the HACCP methodology in particular, are as much about international trade as they are about food safety. The absence of such systems will increasingly constitute a barrier to accessing export markets. Most producers already do much of what is required of a quality assurance system in their day-to-day management and thinking, but at the end of the day, as far as the customer is concerned, "If it wasn't written, it didn't happen" still applies.

In recent years, the Vietnamese government issued lots of policies and has established national programmes to protect the environment and control residues of pesticides, veterinary drugs and other anti-biotic for sea product safety. However, the implementation of the policies and the control programmes are not taking lace synchronously among industries, provinces and food producers. As a result, the effectiveness of the implementation is low and hazard infection is widespread. Specifically, the US and EU markets weekly warn of infections of microbiology and anti-biotic in Vietnam's seafood. Therefore, the Ministry of Fisheries issued Decision No.7/2003, dated August 5, 2003 to establish the National Fisheries Quality Assurance and Veterinary Directorate (NAFIQAVED) which replaces the NAFIQACEN. The NAFIQAVED is responsible for state management on quality, hygiene, safety and fisheries veterinary from primary production (including hatchery, culture, veterinary and feed production) to processing and distribution of the final products, aiming to prevent fisheries diseases; sea product safety, hygiene, quality assurance and consumer's health (Ministry of Fisheries, 2003). The decision strengthens the power and liability of the NAFIQAVED in state management on fisheries quality in the chain. Moreover, it also enhances the role and responsibility of all local governments, provincial agricultural departments, seafood companies and other relevant institutions and organizations on quality management in primary production and other stages in the chain. The decision is ex-

pected to lead to good quality of seafood in order to meet customer's requirements and expectations in the future.

Quality management in the seafood supply chain, especially shrimp chain, is a very important task of the SFCs, both in Vietnam in general, and in the MD in particular. They need to control the quality from primary production to the distribution of the final sea products according to international standards in order to make sure that hygiene, safety and quality of the sea products are meeting the consumers' requirements and expectations. To do this, the feasible quality management in the seafood supply chain is one of the main measures that the SFCs could use for quality assurance. Apart from international quality standards that the SFCs have to follow, relevant other issues, such as organization, management, technology, training and human resources, are also important to obtain business objectives in an efficient and effective way. While the companies do not have not sufficient capability to apply the HACCP standard in the whole chain, the policies, regulations and degrees relating to seafood safety, hygiene and quality by the government, as well as the supports of VASEP and NAFIQAVER, still play an important role in quality assurance from primary production to the distribution.

List of abbreviations

WHO	World Health Organization
MD	Mekong Delta
SFCs	Seafood Companies
HACCP	Hazard Analysis and Critical Control Points
CCP	Critical Control Points
ISO	International Standard Organization
VASEP	Vietnam Association of Seafood Exporters and Producers
NAFIQACEN	The national Fisheries Inspection and Quality Assurance Center
NAFIQAVED	The national Fisheries Quality Assurance and Veterinary Directorate
SCM	Supply Chain Management
SCQM	Supply Chain Quality Management
SQF	Safe Quality Food
GMP	Good Manufacturing Practice
SSOP	Sanitation Standard Operation Procedures
BRC	British Retail Consortium
EU	European Union
US	The United States
SOEs	State-Owned Companies
HCMC	Ho Chi Minh City

APPENDICES

See 'Appendices' :

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