Seafood supply chain quality management
Loc, V.T.T.

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2006

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):

Copyright
Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

Take-down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): http://www.rug.nl/research/portal. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.
Chapter 7

Conclusions and Recommendations

7.1 Introduction

The research is implemented in eight steps and presented in seven chapters. The first six chapters provide the research background, methods and methodology (Chapter 1), literature review (Chapter 2), company survey (Chapter 3), the SCQM framework (Chapter 4), the framework test (Chapter 5), and the seafood supply chain quality improvement measures (Chapter 6). This chapter draws conclusions and provides some recommendations. Chapter 7 is divided into an introduction, conclusions of research products, and recommendations for seafood quality improvement. Next is a section on the changes that have taken place since the start of the project. The final section presents recommendations for further research.

7.2 The main research findings and conclusions

The most important research findings relate to (1) the importance of HACCP systems in food quality assurance, (2) the survey regarding the quality problems of the shrimp supply chain in the MD, (3) the seafood supply chain quality management framework, (4) the SFC case studies (5) the SFC quality improvement process, and (6) the interviews concerning the chain quality improvement measures.

7.2.1 The importance of HACCP systems in food quality assurance

One of the most important tools in food quality and safety assurance is the HACCP program. HACCP – an approach to processing quality control and food safety – is used in the food industry. It is a prevention-based system and it aims to identify all possible hazards.
Within an HACCP system, potential hazards are identified and risks are analyzed during each phase of production, critical control points for preventing such hazards are identified and constantly monitored, and corrective actions are taken when necessary. Record keeping and monitoring procedures are used to ensure that the system is working. It involves examining and analyzing every stage of a food-related operation in order to identify and assess hazards, determining the “critical control points” where action is required to control the identified hazards and establishing the critical limits that must be met. It also involves the monitoring procedures that are needed at each critical control point and the establishing of corrective procedures when a deviation is identified through monitoring of the HACCP.

A proper HACCP system necessitates a combination of a technological and a managerial focus. Such a techno-managerial approach for food supply chain safety and quality management is mentioned by many authors. This research relies mainly on the approach of Luning et al., (2002).

7.2.2 The survey results

The survey concerned 32 SFCs in the MD. Conclusions of the survey results focus mainly on seafood supply chain quality management by the hatcheries, farmers, collectors/wholesale buyers, SFC processing and distribution. Many quality managerial and technological problems within the SFCs and their supply chains have not been managed and controlled completely. In addition, the role of the government, the Fisheries Industry and the support organizations for chain quality assurance and improvement are crucial.

- Most of the hatcheries in the MD are of a small size. These small hatcheries lack modern technologies and do not have sufficient possibilities to invest. At the same time, the capacity of the larger hatcheries is insufficient to provide high quality shrimp seed for the regional demand. Moreover, both Fisheries Industry management and company quality management have not been able to control any quality activity of the hatcheries. Low quality shrimp seed carrying disease germs has been marketed to the MD through uncontrolled sources.
- Although farmers in the MD are supported by the local government, the Department of Fisheries, FRDP and the Extension Centre in terms of culture techniques, knowledge of product quality and safety, shrimp materials still involve hazards. On the one hand, the farmers themselves do not feel responsible for ensuring product quality or they apply culture techniques insufficiently by using forbidden antibiotics. On the other hand, the Department of Fisheries and the Extension Centre have not enough qualified staff and equipment to impose these responsibilities in a large region.
Conclusions and Recommendations

- Collectors and wholesale buyers are chain actors who buy shrimp materials from the farmers and sell them to the SFCs. These chain actors – mainly collectors – lack quality knowledge (they even mix injections into the materials themselves), test equipment, storage techniques, and means. These are important reasons affecting shrimp quality.

- Because SFCs in the MD lack the conditions and methods to manage and control product quality within the company and its chain, seafood products in general and shrimp products in particular may still be infected by antibiotics, biological and other contaminants. In other words, the infections can happen anywhere – from upstream to downstream in the supply chain, from fingerling quality, raw material source, transportation, processing, warehousing, inventory, facilities, technology, packaging, to distribution. These problems relate to the HACCP implementation within the company. Almost all SFCs in the MD applied the HACCP system though not sufficiently, as quality control, processing technology, and test equipment are limited. Thus, shrimp final products have been infected during the processing procedure, from inputting shrimp material to the storage of final products. At the distribution stage, the SFCs are only able to control the quality issues related to transportation and storage. The moving time of shrimp material throughout the chain and the storage time very much affect the shrimp quality. In most of the survey cases, the distribution of shrimp materials from farmers or from offshore to the company takes a long time. For instance, it takes three to seven days if the SFC is located far from its material source.

- The Fisheries Industry, local fisheries departments and support organizations play an important role in chain quality assurance and improvement – not only in seafood primary production but also at other stages of the chain. The reasons are that the SFCs’ participations in primary production quality assurance are still limited due to their finances and managerial-technological constraints. In addition, all chain stakeholders including the SFCs have been incompletely integrated in order to solve quality and safety problems during primary production. As a result, there are limitations to enhancing the responsibility of the farmers and other relevant stakeholders to guarantee the quality of raw materials. At the company level, local government, fisheries industry, and support organizations fail to implement a proper HACCP audit and inspection system. Therefore, the NAFIQAVED must cooperate with local fisheries departments (Extension Centre, FRDP, and Fisheries Department) to improve shrimp quality during primary production. Activities that are required for cooperation are: guiding the culture techniques, training on how to maintain raw materials, providing quality control information concerning chemical use during culture procedures, and expanding the regulations and the decrees related to fishery quality and safety.
Furthermore, the survey revealed a functional organization with a top-down culture, a lack of market orientation, and difficulties with respect to chain collaboration.

### 7.2.3 The seafood supply chain quality management framework

Development of the SCQM framework aims to cover the seafood chain problems mentioned above subsection. The possibilities to improve the quality are different for the SFC part and for the primary production part. In primary production, there are many small hatcheries, farms and collectors wholesale buyers. Here the support organizations (NAFIQAVED and VASEP) and local fisheries departments have to play a major role. Apart from that, there is the role of the SFCs in their supplier quality management and partnerships. The primary production part of the framework stresses the importance of broad support and of good horizontal and vertical collaboration. In the SFC part, the main actors in realizing improvement are the SFCs. The SFC part of the framework stresses the HACCP implementation.

### 7.2.4 Test results in two case studies

The framework was applied to two SFCs. Quality management in general and the HACCP system implementation in particular are tested in two SFCs in the MD. Test results are presented and discussed in Chapter 5. The focus was on testing HACCP implementation. This included tests on (1) the development and on-site verification of the flow diagram; (2) conducting a hazard analysis in the company (Principle 1); (3) determining Critical Control Points or CCPs (Principle 2); (4) establishing of critical limits for each CCP (Principle 3); (5) establishing a monitoring system for each CCP (Principle 4); (6) establishing a corrective action plan (Principle 5); (7) verification of the HACCP plan (Principle 6); and (8) establishing record-keeping and documentation (Principle 7). The test proved to be useful. Many quality gaps as well as chain deficiencies identified in this phase proved to form a sound basis for developing quality improvement. The following are main conclusions of the test results in companies A and B.

Although company A and B differ with respect to organizational mechanism (state-owned and private SFCs) and decision-making levels, they have the same techno-managerial problems regarding product quality and safety assurance during primary production. Both of these companies have not applied HACCP in the primary production yet, because they did not enough money and managerial capacities to implement HACCP in their chains.

At the company level, A and B have implemented the HACCP system albeit not sufficiently. For instance, quality assurance audit in general and HACCP audit in particular do no feature in the HACCP implementation procedure. In addition,
managerial improvement and encouragement of employee participation are limited due to top-down management. The organizational factor should be improved by a bottom-up change because in a bottom-up structure the initiatives for change come from the people in the organization and, they are supported by the lower and middle managers. Bottom-up change is essential to the SFCs’ organizational innovation and is very useful in terms of adapting operations and technologies in order to change requirements of work. Empowerment, involvement and participation enable this change. An important condition for change is that the management is open to change. All of these issues link organizational behaviour to quality in the company. In distribution, company B is faced with transportation difficulties due to that fact that they are located far from the harbour, while company A deals with problems concerning storage time.

7.2.5 The SFC quality improvement process

In order to further improve seafood quality and safety at the SFCs, a quality improvement process is suggested. The process consists of nine steps. They are having top management commitment (Step 1); setting a company’s quality performance goals (Step 2); implementing quality management in practice (Step 3); comparing implementation results with the company’s goals and HACCP standards (Step 4); identifying quality gaps and deficiencies (Step 5); planning a quality improvement (Step 6); implementing the quality improvement plan (Step 7); checking the implementation results (Step 8); and analyzing the results (Step 9). Because time was limited, the nine steps were not tested completely. Instead, a meeting was organized for each of the two participating SFCs plus their supporting organizations. The identification of so-called company factors and chain factors proved to be very useful.

7.2.6 Chain quality improvement measures

Like the SFC quality improvement process, chain quality improvement measures are included in the improvement phase. Chain quality improvement measures are based partly on the SFC feedback on chain quality problems and on the improvement possibilities there. To obtain a systematic understanding of these problems and possibilities, an interview round among chain actors and experts was conducted. Interview results gave us possibilities for chain quality improvement. The most important suggestions concern (1) establishing larger hatcheries that will be able to gain capital to invest in modern technology and to develop adequate quality management in order to make it possible to apply for an HACCP program; and (2) establishing large culture farms/cooperatives that can easily receive centralized support from support organizations. Support activities include an input-output process, product inspection, techniques, capital, management, technology, and environmental protection.
Chapter 7

7.3 Recommendations for further seafood quality improvement

This section contains a number of recommendations that are based on the test results and experiences with the shrimp supply chain during the research; they are however not direct research results. Recommendations for company A and B, managerial-technological interaction, management, and technology are presented below.

7.3.1 Recommendations for the test companies

7.3.1.1 In the case of company A

In order to achieve quality objectives, company A needs to consider the following.

- **In the short term**

  The company should follow the following four-step process:
  - Step 1: Considering the status quo of the company, which can help the company understand where it stands and what it needs to implement an improvement plan.
  - Step 2: Discovering the gaps and finding solutions to prepare the implementation of the improvement plan.
  - Step 3: Changing the managerial method (if necessary) to ensure all employees will participate – focus especially on bottom-up change.
  - Step 4: Implementing the improvement plan by using the PDCA cycle.

The implementation of this four-step process will help the company achieve its quality goals. However, the level of implementation achievement depends on the company’s managerial and technological conditions, capital condition, and on the attitude of the people involved.

- **In the long term**

  The company should be equitized into a joint-stock company. This kind of company can obtain more capital to invest in all aspects that are related to quality improvement, such as investments in modern processing technologies and equipment, managerial changes, organizational changes. Besides, the company could invest in primary production to ensure the quality of raw material, or it could invest in farmers and provide a quality control. This would enhance the quality of the company’s input materials. However, employee responsibility and awareness are very important during the implementation process in order to obtain quality objectives of the company.
Conclusions and Recommendations

7.3.1.2 In the case of company B
It is relatively easy for company B to implement the improvement plan. For a company with join-stock ownership, it can be easy to change quality-oriented management methods, to invest in modern processing technology and equipment, to invest in primary production, and to monitor the quality of raw material. The main issue is encouraging all employees who participate in quality management and increasing their responsibilities. To do so, the company should organize quality training and initiate good employee policies that are related to product quality assurance and improvement. These advantages would help the company to successfully implement the improvement plan. The company should also start implementing the improvement plan by going through the above-mentioned four-step process.

7.3.2 Recommendations at chain level
Solutions for further seafood quality improvement should combine technological aspects with attention for appropriate type of management. This should occur throughout the chain, from primary production to distribution. To do so, the industry support organizations should prioritize technology investment, especially in primary production. The industry has to invest in technology and management of the Extension Centre and FRDP. These latter organizations are very close to the farmers, so with these investments the farmers receive help quickly and effectively. Moreover, it is necessary to have a strict ban on behaviour that threatens seafood safety and quality, such as mixture injection, trade cheating, negative competition, use of forbidden chemicals in fisheries production, processing and storage, and to introduce suitable penalties. To this end, local market managers, the Fisheries Department, the Extension Centre and SFCs should increase the integrated observation and inspection of the buying-selling market for shrimp. At the same time, SFCs should not only apply HACCP within the company but they ought to expand it to the wholesale buyer and collector. Moreover, it is necessary to use effectively and efficiently modern technology and equipment that has been invested in by large SFCs, NAFIQAVED and FRDP. Furthermore, the HACCP program must be applied in both hatchery and farm and audited by the support organizations (VASEP, NAFIQAVED, and local departments). These issues should be discussed at VASEP meetings in which all SFCs and other stakeholders are involved.

7.3.3 Managerial recommendations
- **Leadership**
Most of the SFCs in the MD use top-down management. Bottom-up communication and management is essential if one wants to change the SFC organization. This bottom-up communication is also useful when adapting operations procedures and technology to the changing work requirements. An important condition for change is always change-oriented leadership. Bottom-up
management is necessary to gather employee feedback for quality improvement and to keep them involved. The opinions of employees therefore should be considered a useful source of information for quality improvement decisions. Middle managers and line managers have both responsibilities - following the higher managers’ decisions and reflecting the employee feedback. Top managers should take into account managerial improvement and encourage employee participation.

- **Organizational behaviour and training**

The management of the company should ensure that there is interaction between management and technology in aiming for quality and safety to meet or exceed customer expectations. Therefore, the company has to understand the customer requirements concerning product quality, the company’s situation, and investments needed in quality improvement. These requirements have to be communicated, and all levels of managers and employees at the company have to be trained, so that customers can be satisfied.

The following figure shows four managerial levels in the company: the first line managers (production group management), the second line managers (product line management), the middle managers (factory management), and the top managers (company management). Top and middle managers should be officially trained on quality and high managerial knowledge, because they are the ones that set up the company’s quality goals and the overall control. Furthermore, top and middle managers are responsible for training quality control knowledge to (1) the first and second line managers, (2) all employees in the company, and (3) the shrimp wholesale buyers. The first and second line managers must be trained in quality and managerial knowledge, but also in relevant fisheries specializations. The workers should be trained by the top and middle managers, but also by the first line managers on the quality issues each group ought to implement. Also, managers of all levels need to be taught statistical knowledge and skills.
7.3.4 Technological recommendations

Improvement of and investment in technology and equipment to ensure product quality and technical requirements are extremely important if one wants to prevent hazardous infections in the seafood supply chain. Therefore, together with aiming at hygienic manufacturing, each SFC should collaborate with other SFCs, the NAFIQAVED and the FRDP who have invested in modern technology and equipment for both quantitative and qualitative tests of all fishery hazards.

Furthermore, the following technologies have been widely applied in the EU and in developing countries such as Thailand. Application of these technologies will help SFCs to enhance quality improvement in order to meet the quality requirements of import markets as well as to be able to get more involved in international business. Thus, SFCs need to research and use:

- new identification systems and data handling procedures, and these must often be integrated into their quality management system and their HACCP system;
- a blend of short-term and long-term laboratory and field consumer trials and surveys. Research into consumer information, expectations and acceptance can show how different types of information will influence ratings for acceptance and future purchase intentions;
- some technologies for food quality assurance such as hurdle technology, osmotic treatment, and shrink-wrapping that are currently in use and are expanding to developing countries. Hurdle technology and osmotic...
Chapter 7

treatment are tools to obtain intermediate and end products of greater quality. Shrink-wrapping has been introduced as a suitable method for food quality and safety in value added seafood products;

• a quality index method and the definition of storage management and production planning procedures. The quality index method includes sensory tests on raw and cooked fish;

• time analysis of residues in seafood.

7.4 General situations of SFCs in the MD and the test companies at present (2006)

According to the information from the VASEP website, from some members of SFC staff who are studying for their Master’s degree at Cantho University, and from several students’ graduation theses in Cantho University, compared to 2003 SFCs in the MD in general and the test companies in particular now focus very much on product quality improvement within the companies and their chains. Many SFCs have been equitized and some large companies have been listed in the Vietnam stock market to gain more capital for their quality improvement activities.

Quality Control Departments of the SFCs enhance quality control at four levels of management, they transfer quality knowledge onto their employees and they encourage employees’ feedback on product quality and safety by introducing bonus policies. In particular, company A was equitized into a stock company. So far, this type of ownership has lots of advantages; for example, (1) the company receives a large amount of share capital from its employees, which can be invested in modern technology as well as in quality improvement, (2) the company also achieves loyal employees on quality behaviour for the implementation of HACCP system as well as for the application of PDCA cycle strictly. Company B however invests its capital in the quality improvement of the HACCP implementation process and high quality materials. Together with a stricter management and more cooperation between local fisheries departments and support organizations, the quality and safety of seafood products of the SFCs in the MD in general and the test companies in particular increase as a result. It is a fact that the percentage of SFC seafood containers that is sent back from import markets decreases a lot.

7.5 Recommendations for further research

Shrimp quality improvement in the entire chain is very important for Vietnam’s shrimp industry. The shrimp supply chain in the MD includes the primary production stage (hatcheries, farms, collectors, and wholesale buyers), the SFC
stage, and the distribution stage. The focus of the current research has been on the SFC stage, with an emphasis on the implementation of HACCP. Some attention has been paid to primary production.

Although the current situation of SFCs in the MD is showing progress with respect to ensuring seafood products in general and shrimp product quality and safety in particular, it is necessary to focus further research on primary production and export aspects.

As is mentioned in the study, SFCs play an important role in the supply chain. Therefore, further scientific research regarding seafood safety in primary production and export distribution needs to include the role of SFCs and support organizations as well.

The author strongly advises further research into the following topics/issues.

- Research on shrimp seed quality management and its impact on the quality of raw shrimp material and on final shrimp products.
- Research on shrimp quality and safety control at the collector/wholesale buyer stage.
- Research on the seafood market channel and the organization of seafood exports in Vietnam.

These research topics will be very useful for Vietnam’s Fisheries Industry, the local governments, VASEP and NAFIQAVED, and for all chain stakeholders. They will help to improve shrimp quality and safety throughout the chain as well as help fisheries experts to direct further improvement of the seafood supply chain.