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Vertical integration as an alternative governance structure of value chain quality management: The case of Pangasius industry in the Mekong River Delta, Vietnam

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List of abbreviations

AFA	Fishery association in An Giang
BRC	British Retail Consortium
CCP	Critical Control Points
CTU	Can Tho University
DARD	Department of Agriculture and Rural Development
EU	European Union
GAP	Good aquaculture practices
GHP	Good Hygiene Practices
GMP	Good Manufacturing Practice
GSO	General Statistical Office of Vietnam
HACCP	Hazard Analysis and Critical Control Points
MOAF	Ministry of Agriculture and Forestry
MOFI	Ministry of Fisheries
MRD	Mekong River Delta, Vietnam
NAFIQAVED	National Fisheries Quality Assurance and Veterinary Directorate
PPC	Provincial People Committee
SQF	Safe Quality Food
SSOP	Sanitation Standard Operation Procedures
SCM	Supply Chain Management
US	United States
VASEP	Vietnam Association of Seafood Exporters and Producers
VBARD Vietnam	Bank for Agriculture and Rural Development
VINAFA	Vietnam Fishery Association
VINAFISH	Vietnam Fishery Society
VCCI	Vietnam Chamber of Commerce and Industry
VND	VN dong (local currency)

1. Introduction

The organization of the food supply chain has changed toward closer vertical integration between the stages in the chain (Boger, 2001; Hobbs, 2000). Fish production systems are characterized by the production of raw materials coming from fish culture, processing, followed by distribution and retail and finally consumer processing. Production systems have the creation of quality in common, but also the maintenance of quality throughout the entire food supply chain in order to provide consumers with high quality products. One of the critical choices that firms make concerns determining the degree of vertical integration; e.g. deciding which activities should be performed in-house and which activities should be carried out in co-operation with suppliers or customers. As Pangasius industry concern, the vertical integration systems between fish farmers and processing/export firms have dramatically shifted toward longterm contract coordination. Among a number of driving forces for this shift, the level of risk faced by primary producers, stringent quality requirements for processing and changes in production technology have been the main ones (Hobbs, 2000). It has been indicated that consumers' demand for food quality and safety has been a pivotal factor in increasing vertical integration in the food industry.

Theories of industrial organization and inter-firm relations provide a useful basis for understanding the nature of vertical integration and its effect on firm performance. Scholars of industrial organization view vertical integration as a strategic tool in creating competitive advantage (Porter, 1985; Barney, 1991). From the perspective of transaction cost economics (TCE), vertical integration is viewed as one form of governance structure that is determined by attributes of transaction and assumptions of human behaviour (Williamson, 1985). The basic question to be analyzed is what kind of governance structure provides an efficient framework for transactions with varying level of asset specificity (Borger, 2001). Also, agency theory discusses problems of measuring individual performances and the importance of incentives in vertically integrated firms (Jensen and Meckling, 1976; Eisenhardt, 1985). Vertical integration has considerable benefits, but also implies significant risks and costs. Some firms may vertically integrate their activities with the objective of minimizing transaction costs, increasing their control over resources, capturing more rent, increasing entry barriers and foreclosing competitors. However, vertical integration requires a high capital investment and it may result in reduced flexibility and increased bureaucratic costs.

2. Research background

Aqua-cultured fish is one of the dominant export products in Vietnam. The development of this sector is a major source of foreign currency and employment opportunity. The success of the sector encourages both local and foreign investment. Vietnam has a coastline of more than 3,200 km long with over 3000 islands, a wealth of natural inland water bodies (lakes and rivers) and area of ponds and seasonal flooded grounds. The total water area is still increasing by the construction of new dams and reservoirs.

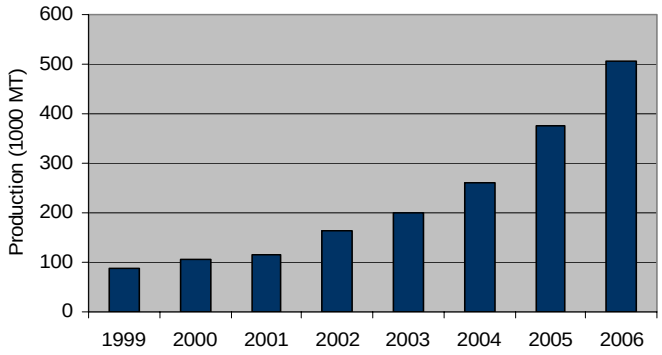
The growth in the Vietnamese seafood exports has been accompanied by strong growth in aquaculture production in terms of quantity and value in the past decades and is accompanied by

intensification of the sector. Today Vietnam is one of the top seafood exporters in the world, with products from aquaculture accounting for more than 40% in volume of seafood produced and almost 60% in value (MOFI, 2006).

In 2005, Pangasius products emerged as a leading source of export revenue. Total production of Pangasius increased steadily, from 45,000 tonne in 1997 to 315,000 tonne in 2004 (MOFI, 2005). The Mekong River Delta (MRD) supplies most of the Pangasius production: 300,000 tonne in 2004 (MOFI, 2005). In 2006 the EU has become the largest Pangasius export market for Vietnam and around 60% of the total value of Vietnamese exports to the EU concerns fish – mostly Pangasius from the MRD (MOFI, 2006).

Tra (Pangasius hypophthalmus) and Basa (Pangasius bocourti) are commonly called freshwater Pangasius and were cultured in Vietnam first in the MRD in the 1960s. The Ministry of Fishery (2005) said that fresh water fishery plays a role in rapidly developing a strong export market for Vietnamese fish products, especially Pangasius. Since 1995, successful artificial propagation as well as expansion and improvement of marketing of Pangasius products have led to a rapid development of farming activities of these species. Total production of Pangasius increased about eleven times (45,000 tonne, 315,000 tonne and over 500,000 tonne in 1997, 2004 and 2006 respectively). At the moment (2007), about 68 processing factories are located in the region, which can process 1,400 tonne of Pangasius per day for export. Pangasius is preferred in many countries because of its white fish, sweet, its good smell, and absence of tiny bones. They can replace other species of white fish that are being exhausted. Pangasius is chosen as the symbol for Vietnam's aquatic **...?...** due to its high quality. Pangasius of Vietnam is as famous as other well-known aqua products such as Norway's salmon (MOFI, 2006). According to MOFI (2006), it is estimated that Pangasius production will reach up to about 1 million tonne in the MRD by 2010. However, because the Pangasius culture development has been explosive without a controlled longterm Government development in place, it would appear that this overly rapid increase in production now exceeds the capacity of processing firms and the export demand (Hao, 2006). The rapid and improperly planned development of this industry in the MRD raised also other issues related to fingerlings, feeds, credits, markets and legal measure, etc. Therefore, recently, it was recommended that Pangasius production should not exceed 600,000 tonne by the year of 2010 (VASEP, 2007).

Figure 1. Development of Pangasius culture production between 1999-2006 in Vietnam (VASEP, 2006)



However, almost all of the Pangasius processing/export companies in the MRD suffered losses in recent years for different reasons. The most important reason being the impossibility to guarantee quality and safety (Khoi, 2006). The Pangasius products were infected by antibiotics, microbiology and other contaminants. Some Pangasius containers were sent back or destroyed as a result of the strict import quality controls in the EU and the US (VASEP, 2005). There are four major quality problems (Khoi, 2006): (1) new and more stringent rules concerning fish quality and safety of import markets; (2) lack of adequate production technology at farm level; (3) opportunistic behaviour of chain stakeholders; (4) lack of hazard analysis and critical control points (HACCP) implementation at the company level.

Fish quality has dimensions related both to its production process and the final product. Its determinants can be grouped into four : hygienic properties, nutritional properties, functional properties and organoleptic properties (Abalaka 1999). Health hazards from the fish can arise from the raw materials used, from handling and through the other stages involved in the processing, transportation, storage and the sale of the food. Most fish quality problems from the developing country like Vietnam is related to poorly defined inspection and approval procedures, weak technical regulations, and lack of staff for inspection and laboratory testing. Moreover, poor levels of personal hygiene and sanitation, lack of infrastructure for fish marketing and distribution and poorly defined institutional framework are also the causes for poor quality of fish from these countries.

On the other hand, importing firms in general and the EU wholesalers in particular have tight rules regarding fish imports from developing nations. The exporters of fish have to adapt to the new and more stringent rules concerning safety and quality standards such as the implementation of the Hazard Analysis Critical Control Point (HACCP) system for the EU, the USA and other markets, which could have a considerable impact on the volume of products exported in the short-medium term (FAO 2000). The exporters from Vietnam, therefore, may find it difficult to overcome their problems and meet the requirements of their customers in developed nations easily on their own.

The close coordination of activities along the supply chain from the seeds to production to processing and exporting was recognized as the successful factor to the food industry (Hobbs, 2001). How does close vertical integration in the chain contribute to the fish quality management? To our best knowledge, no empirical study has been done to explore the relationships between vertical integration and quality management of the Pangasius industry in Vietnam. This article will try to answer the question through an empirical survey in the MRD, Vietnam.

3. Theoretical perspective

3.1 Vertical integration and transaction cost

Vertical integration has been one of the vital issues in determining the boundaries of the firm and the types of relationships between firms. Different scholars define vertical integration differently. For instance, Porter (1980) defined vertical integration as the combination of technologically distinct production, distribution, selling and/or other economic processes within the confines of a single firm.

Others define vertical integration as the combination of two or more stages in the production-marketing chain under a single ownership (Marion, 1976; Den Ouden et al., 1996). In this paper, vertical integration refers to a firms' ownership of vertically related activities. The greater the firms' ownership and control over successive stages of the value chain of its product; the greater it is vertically integrated.

A great deal of debate has centred on what drives a firm to vertically integrate; why firms buy-out one of its suppliers or internalize the production system within a firm. The study of transaction costs in vertical integration and contracting traces back its roots to Coase's (1937) seminal paper "The Nature of the firm". Coase's main argument was that a firm "suppress (es) … the price mechanism", i.e. a firm will integrate any part of its production process, as long as doing the work in-house is cheaper than purchasing the input or service on the market.

According to TCE, the assumption of human behaviour may determine the choice of governance structure. These include the bounded rationality and opportunistic behaviour. Opportunism is the assumption that, given the opportunity, decision makers may unscrupulously seek to serve their self-interest. Williamson (1985) identifies opportunism as "a source of behavioural uncertainty". Every individual is not continuously or largely given to opportunism. Instead some individuals are opportunistic some of the time, and differential trustworthiness is rarely transparent beforehand. As a consequence, ex ante screening efforts are made and ex post safeguards are created. Otherwise, those who have the least principles (are most opportunistic) will be able to exploit those who have more principles. This leads to a performance evaluation problem. A performance evaluation problem arises when a firm of which the decision makers are limited by bounded rationality and have difficulty assessing the contractual compliance of the exchange partners (Rindfleisch and Heide, 1997). The antecedents of the performance evaluation problem are bounded rationality and behavioural uncertainty. The constraint of bounded rationality becomes problematic in uncertain environments, in which the circumstances surrounding an exchange cannot be specified ex ante (environmental uncertainty) and performance cannot be easily verified ex post (behavioural uncertainty).

An important difference between relationships across markets and relationships within firms is related to incentives, where the owner of a firm has to encourage its employees to improve their performance. In relation to vertical integration, this agency problem may be a major source of inefficiency. On the other hand, market contracts provide high-powered incentives- each party to the contract is primarily interested in maximizing his or her own returns. The agency theory provides a useful explanation in evaluating the performance of an individual exchange party. The agency theory explains how to best organize relationships in which one party (the principal) determines the work, which another party (the agent) undertakes (Eisenhardt, 1985). This theory states that under conditions of incomplete information and uncertainty, which characterize most business settings, two agency problems arise: adverse selection and moral hazard. Adverse selection is the condition under which the principal cannot ascertain if the agent accurately represents his ability to do the work for which he is being paid. Moral hazard is the condition under which the principal cannot be sure if the agent has put forth maximal effort (Eisenhardt, 1989). In fisheries, processors may require a certain level of quality in the fish they purchase and in the timing of deliveries to their plants. Even with integration, monitoring the

level of effort that an employee invests in catching a large volume of fish or in maintaining quality is often not directly possible and any ex post indication of this effort is an imperfect measure.

Theories of industrial organization provide additional insight on vertical integration. For instance, Porter (1980) argues that vertical integration is a valuable instrument for the firm in creating competitive advantage by taking advantages in imperfect markets. According to him, the strategic purpose of vertical integration is to utilize different forms of economies namely: economies of combined operation, economies of internal control and co-ordination, economies of information, economies of avoiding the market and economies of stable relationship. Porter argues, in the same way as for instance Pfeffer and Salancik (1978), that vertical integration is important for reducing external uncertainty (e.g. availability of fish) and securing supply of critical inputs such as fingerlings.
In conclusion, the industrial organization perspective and the inter-organizational theories provide a useful basis for understanding the nature of vertical integration. The transaction cost theory views vertical integration as one form of governance structure, which is determined by the main attributes of transaction and assumptions of human behaviour. Also, the theories of industrial organization view vertical integration as a strategic tool in creating competitive advantage.

3.2 Transaction cost economics (TCE) and quality management

The application of TCE becomes more and more popular in empirical studies dealing with vertical coordination in agriculture (Frank and Henderson, 1992; Hobbs and Young, 2001; Boger, 2001, Szabo et al. 2004; Montaigne et al. 2005). Coase (1937) uses the concept of transaction costs to explain the organization of firms and the way in which they interact along the supply chain. Transaction cost theory is based on three behavioural assumptions: bounded rationality, opportunism and risk neutrality. Williamson (1985) proposes that certain transaction characteristics affect vertical coordination or the choice of the governance structure. Raynaud et al. (2005) argued that governance structure choice is a function of the (firm or chain) strategy for guaranteeing quality (including food safety). Williamson (1985) identifies asset specificity, uncertainty, and frequency as key transaction characteristics affecting the emergent governance structure. Asset specificity represents the degree to which an investment is specialized to a particular supplier or buyer, provoking switching costs. Sunk costs enforce opportunistic behaviour and create hold-up problems. Uncertainty contains the degree of unanticipated environmental changes or behavioural responses by the business partner. Besides prices, quality uncertainty is a major concern in agribusiness due to the different food crises especially in the fish industry (Kambewa, 2006). Frequency refers to how regularly transactions are conducted. TCE offer one perspective on the relationship between market organization and product quality. When product quality attributes are difficult to measure the producers may engage in opportunistic behaviour to exploit private information by failing to perform as agreed, such as shirking or cutting corners on quality, also referred to as moral hazard. This is expected to lead to contracts with added security features to mitigate the hazard (Martinez, 2002). TCE provide the most common theoretical framework for contracts and vertical coordination in food production. Contracts may reduce moral hazard problems through centralized decisions about input factors (feed, veterinary, etc.) and production standards. The problem of adverse selection in case of unobservable quality attributes is decreased by contract systems with inherent monitoring approaches. A longterm orientation could enhance the

processors' ability to introduce new technologies. Den Ouden et al (1996) identify growing quality requirements of customers as a major driving force of contracts and vertical integration. In particular, product differentiation in order to meet changing consumer demands regarding credence attributes such as food safety and environmental issues is considered a main driver of closer ties in the food supply chain. Transmitting the changing demands to the farm stages is considered more transaction cost efficient under contracts and in vertically integrated systems. Lawrence et al. (1997) argue that under these circumstances longterm contracts allow transaction cost savings compared to traditional marketing channels. Farmers may also save transaction costs through longterm contracts, e.g. by settling a premium for higher quality with a one-time negotiation.

In the agricultural economy, TCE are basically used for analyzing two issues: the different forms of agricultural organization and the causes of vertical coordination (Loader, 1997; Banker-Perry, 1999; Hobbs, 2000; Boger, 2001). The second issue studies the different phases of vertical coordination, namely the relations between farmers, processors, as well as traders and retailers that make up the total supply chain (Hobbs and Young, 2001). The transaction cost theory and the contract theory are applied to this research to deal with the opportunistic behaviours of some of the stakeholders involved in upstream the supply chain (traders, suppliers of intermediate inputs, processors) and explore the relationship between the various transaction cost attributes and the key determinants of governance structure between fish farmers and processing firms in the fish value chain.

3.3 Value chain

According to Porter (1985), value activities are divided into two broad types, primary activities and support activities. This model does not give us a full explanation of how the linkages in the value system are developed. So, it is important to link it with theories of inter-organization in order to develop business relationships among chain actors.

Primary activities are the activities that include the creating of a product, marketing, delivering the product to buyers, as well as after-sales assistance/service. Primary activities are classified into five categories which include inbound logistics (activities associated with receiving, storing and disseminating inputs to the product such as selecting and developing broodstock, receiving and storing fish raw materials, material handling, warehousing, inventory control, vehicle scheduling and returns to suppliers); operations (activities associated with transforming inputs into the final product form such as spawning broodstock, nursing fry to fingerling, fish culture, processing, packaging, inspecting, and facility operations); outbound logistics (activities associated with distributing fish to buyers such as delivery vehicle operation, order processing, scheduling and shipping); marketing and sales (activities associated with providing a mean by which buyers can purchase the fish products and inducing them to buy through advertising, pricing, price information, promotion, channel selection, channel relation and pricing); and service (activities associated with providing services to enhance or obtain the value of the fish product after it is sold and delivered, such as training fish farmers, consulting, installing, repairing supplying parts and adjusting products).

Support activities underpin the primary activities and each other by exchanging inputs. Support activities are classified into four categories, namely procurement, technology development, human resource management and firm infrastructure. Procurement (activities associated with purchasing

inputs used in the firms' value chain, not to the purchased inputs themselves: purchasing inputs include ponds/cages, fishing nets, incubating machines, circulation tanks, water pumps, grinding machines, boats, land, ice, fuel, machinery, laboratory equipment, office equipment and buildings. Technology development (activities that can be roughly divided into efforts to improve fish culture and processing facilities such as fishing methods, qualification rules or technology embodied in process equipment). Human resource management (activities associated with recruiting, hiring, training, developing, compensating and (if necessary) lying off personnel). Firm infrastructure (activities associated with general management, planning to get access to fish, financial activities carried out, drawing up contracts and fish quality management).

The value chain of Pangasius is presented in figure 1. This figure summarizes the stakeholders who are directly and indirectly involved in the chain, from production to consumption both at the domestic and the export market for Pangasius.

In the value chain of the Pangasius, many actors participate in both primary and support activities. Primary actors who are directly involved in the transformation of inputs into outputs include hatcheries, fingerling traders, fish farmers, export traders, local traders, retailers, and processing/export firms. Supporting actors who facilitate the activities of the primary actors include feed mills, service providers, and suppliers of intermediate inputs, institutions, and infrastructure.

To summarize, how value chain activities are carried out determines costs and affects profits. A firm that seeks a cost leadership position reduces the amount of resources it consumes and the price it pays for them. Decisions governing each activity in the value chain determine the nature and quality of the output. A firm that seeks to gain an advantage through differentiation does so by performing its value chain activities, particularly transformation of the input, differently from or better than its competitors. Improving the value chain functions is one of the means of achieving competitive advantage. This idea is especially more important and applicable to firms involved in food businesses. For example, the value chain analysis is helpful for the quality assurance of fish and its products, which requires an organized way of investigating all the activities in the production process of the product.

3.4 Quality performance objectives

Quality must be quantifiable in order to measure the effectiveness of the production system. Nevertheless, it is important to know what other dimensions determine the total performance of the supply chain. The quality in the chain should not be adapted in such a way the total performance is reduced. Therefore, besides the quality description, a quality concept has to be selected in order to measure the total quality performance. In order to quantify the production quality, several concepts are available in literature (Table 1). These concepts are based on the measurement of several quality aspects. It is very likely that performance objectives will influence each other. In the fish industry, consumers not only have concerns about physical product features but also on quality aspects that are related to production primary activities. Therefore, all these aspects should be incorporated in one concept that integrates management and product based aspects.

Table 1: Classification of quality concepts on the basis of performance objectives

Concepts	Product quality	Availability	Costs	Flexibility	Reliability	Service	Other dimensions
Garvin	X	-	-	-	X	X	-
Evans and Lindsay	X	X	-	-	-	X	-
De Toni et al.	X	-	X	-	-	-	Total quality offered: a. In-bound quality b. Internal quality c. Out-bound quality
Isaksson and Wiklund	X	-	X	-	-	X	Capacity environment
Challik and Waszink	-	X	X	-	-	-	Scope
Sloof et al.	X	X	X	-	-	-	-
De Groote et al.	X	X	X	X	-	-	Improvement rate: a. Quality b. Past improvement c. Future ambition
Luning et al	X	X	X	X	X		-
Noori and Radford	X	X	X	X	X		-
Slack et al.	X	X	X	X	X		-

Source: Spiegel, M.Van der, 2004.

Based on the concepts, the following performance objectives have been selected in order to evaluate the quality management. Every stage of the supply chain can be analyzed using the performance objectives. These dimensions will be discussed in general with the Pangasius supply chain in mind.

3.4.1 Product quality

Product quality can refer to intrinsic and extrinsic quality attributes. The intrinsic attributes are connected with the physical product (taste, shelf life, health, safety, etc.). These can be measured in an objective manner. A further distinction in intrinsic attributes can be made into sensory and health attributes. Sensory attributes refer to the aspects of food quality such as flavour, taste, appearance, texture and smell. These are experienced during the consumption. The health attributes are getting more relevant and concern about the nutritional value and the healthy aspects of the product (Lunning et al., 2006).

3.4.2 Availability

Availability is the presence of the right quantity of products in the right place at the right time. For fish this can be very important due to the rapid decline in quality level of fish products or raw materials.

3.4.3 Cost

The cost of the product is cumulative throughout the chain. The chain can only be sustainable when the cumulative costs of the members are lower than the price paid by the customer. This also has to be the case between every connection within the chain. The customer value is the basis for the quality/price perception. To make the supply chain more profitable one can produce a premium quality and get a premium price or reduce costs with avoiding non value adding activities (unnecessary transportation). Often the costs are related to the other performance dimensions as well. Cutting cost will often mean that another performance dimension will decrease. According to the research of Khoi (2006) the main driver apart from quality is costs.

3.4.4 Flexibility

Flexibility is the ability of an organization to respond to a change in recruitments from product, process and resources. Dimensions of flexibility are: volume, delivery, product and mix flexibility. When the flexibility of an organization is high they can make the required change without much effort, time or money. When more quality is demanded the amount of flexibility determines if the organization is able to respond. This is ofcourse dependant on the amount of resources that can be invested. The question here is if the smallholders are flexible enough to adapt to the labeling demands.

3.4.5 Reliability

Reliability or dependability is the ability of an organization to fulfil its commitments (e.g contract with suppliers and customers). A high reliability implies that de dates of delivery are met. Reliability can also discuss the certainty of the quality demands being met. One can define reliability on the long and on the short term.

This is also the case in the Pangasius chain. The reliability of the delivery of the Pangasius to the processors is not high because of the fact of oral contracts and opportunistic behaviour of the chain actors (Khoi, 2006). The reliability concerning the quality of the fish is very relevant. When the level of bacteria or chemicals is too high when imported into the EU, the whole batch or even the container gets rejected. These two forms of reliability can be seen as reliability on the short term.

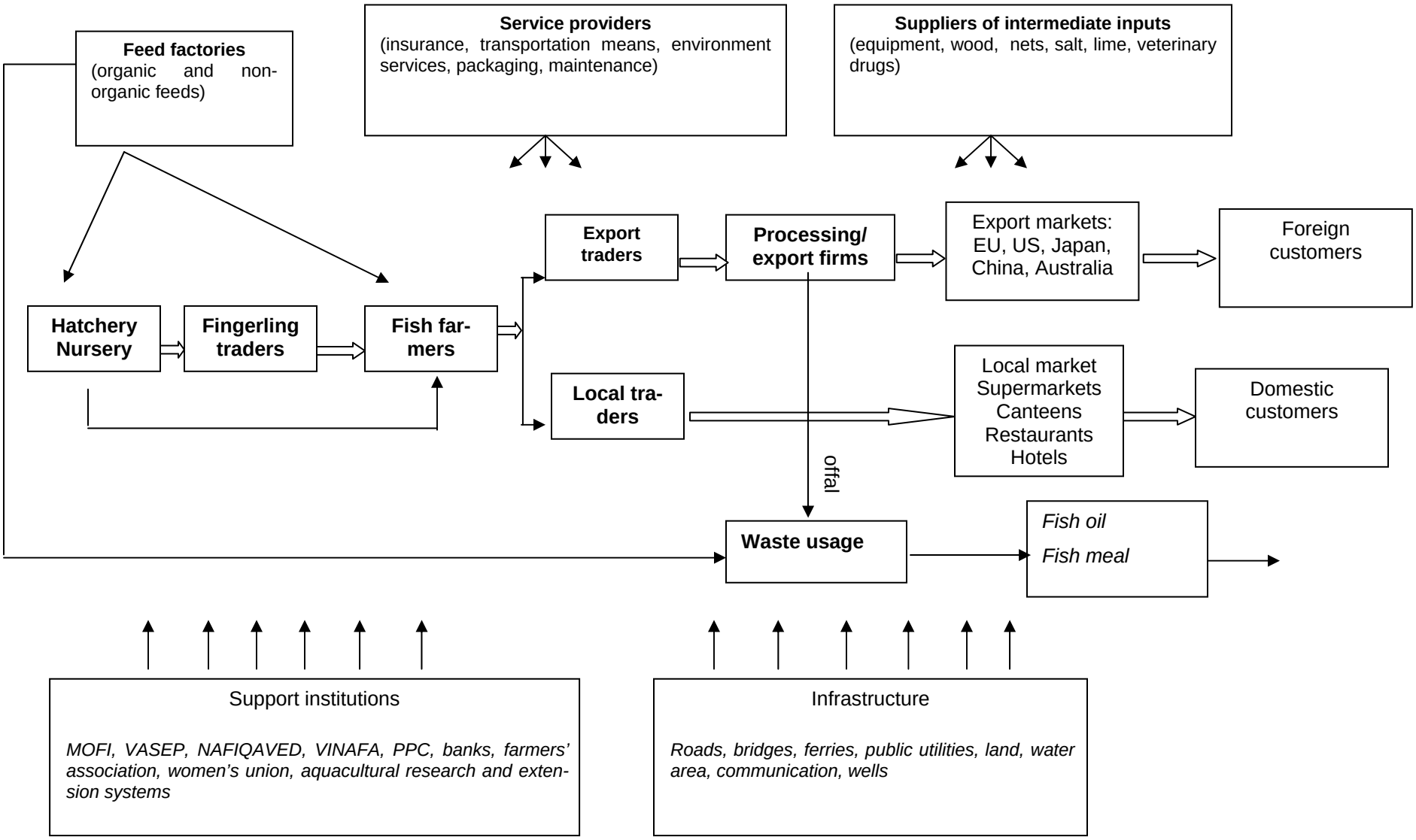
Reliability on the long term has more to do with the sustainability of the chain. At the moment the density of Pangasius aquaculture is intensifying enormously. Some say this is a threat for the sustainability of the industry due to the effect on the environment and the effects on water pollution. However, there has been no study that confirms that the water pollution in the MRD is decreasing or what exactly causes the outbreak of diseases.

3.4.6 Service

Service involves providing support for consumers and customers. This includes e.g. offering a variation in product assortment, making a commitment to each customer as an industry entity, helping customers install their products and providing after-sales support. As discussed earlier, Porter (1985) defines service as one of the primary activities of a value chain.

Khoi (2006) determined that quality is the main performance driver in the Pangasius value chain. At the moment one of the main problems in the chain is the use of forbidden antibiotics. In 2004 there where 109 batches of Vietnamese fishery products rejected, in 2005 this doubled to 215 (Braak, 2007). There is a link between the elements quality, cost and reliability. For a higher product quality one often needs to make more costs. If the quality of the perishable product is good this can lead to a reliable supply chain. However, if the farmer can not rely on the fact that the cost of quality will be covered, or on a steady trade relation opportunistic behaviour will be more likely. The quality rejection of the batches has major impacts on the reliability and costs, thus on the performance of the chain. This is why quality management is so important. This is especially the case when one uses a fair trade or quality assurance schemes.

Figure 1: Pangasius value chain in the Mekong River Delta, Vietnam



Source: PACA (2004) and complied by author

4. Methodology and data collection

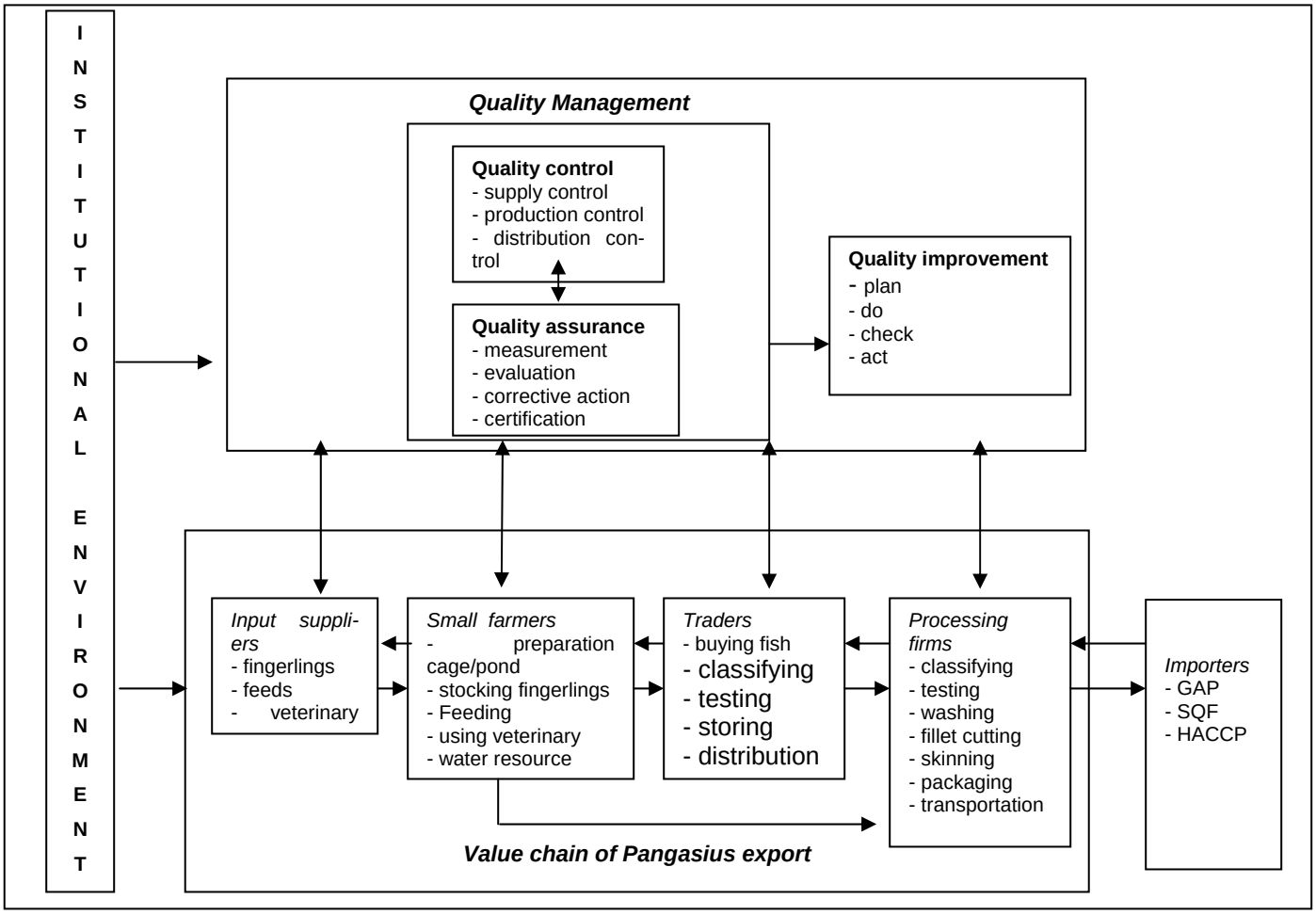
The type of interview used was a focus interview (Yin, 2003). The interview consists of open-ended questions and a set of questions in the form of a questionnaire. Interviews were conducted using open-ended questions with knowledgeable people and experts in the fish industry. After that, the actors in the Pangasius supply chain including the people at hatcheries, fingerling traders, fish farmers, middle traders, retailers, processing/export companies, fisher cooperatives, fishery associations, researchers, institutions in Can Tho City, the province of An Giang and the province of Dong Thap where the most cultured Pangasius from the MRD comes from. Alongside collecting the primary data, we will also consult secondary data. These include documentary information, archival records from relevant organizations, library books and Internet facilities.

We also make a direct observation by investigating into certain value chain activities of the Pangasius primary production toward quality management.

5. Conceptual framework of value chain quality management

Based on the above literature review, the following conceptual framework (figure 2) can be drawn. The model has four constructs: quality control, quality assurance, quality improvement and value chain of Pangasius export. We will explain the relationship between the four dimensions as below .

Figure 2: Pangasius value chain quality management model (Luning et al., 2006 and further moderated by author)



5.1 Explanation of conceptual framework

In order to obtain a good quality end product, quality is more and more managed along the whole chain from the supplier of raw materials to consumption. In order words, we need to organize the supply chain quality management in order to improve the product quality to meet the consumer demands. Figure 2 shows the quality management model in the Pangasius value chain. This integrated conceptual framework consists of two key dimensions namely quality management and business relationships between the value chain actors. The arrows reflect the relationship between these dimensions. Fish quality management is complicated because it involves the complex characteristics of the fish raw material due to variability, restricted shelf life and the large range of chemical, physical and microbial processes. The fish supply chain management is also complex and consists of a large number of linkages. Moreover, many people are involved in the production operations along the food supply chain. Therefore, human behaviour plays a crucial role due to unpredictable and changeable handling. Luning (2002) proposed the techno-managerial approach for food quality management as a way to analyze and solve the complex quality issues. Both the use of technology to understand behaviour of living fish materials and the use of managerial sciences to understand human behaviour is needed. Hence, both technological aspects

(i.e fish characteristics and technological conditions) and managerial aspects (i.e human behaviour and administrative conditions) should be managed in order to improve fish quality products.

In this model, we focus on three main elements of quality management namely quality control, quality assurance and quality improvement. Quality control refers to the operational process aiming to fulfil quality requirements. In the chain quality management, the relationship between quality control and business performance will be analyzed with respect to the four basic control processes: input, the supply control; transformation, the production control; output, the distribution control and processing, the process control. On the other hand, quality assurance refers to the procedures and responsibility respecting to ensure that the product fulfils or exceeds customer expectations. Quality assurance measures the physical process and the quality system; information is collected on how quality is realized and to what extent quality expectations of the customer are met. As for each process performance in the chain, the quality assurance includes four basic steps: measurement, evaluation, corrective action and certification. Quality improvement is the result of quality management that includes increasing customer satisfaction, achieving higher quality levels, reducing cost, increasing productivity and accelerating the process. The quality improvement includes four stages namely plan, do, check and act. These quality requirements and expectations are transformed into processing/export companies performance quality objectives. To implement these objectives, partnership relations between processing/export firms and their chain actors are crucial (Luning & Marcelis, 2006). The chain stakeholders comprise input suppliers such as hatcheries, feed wholesalers, veterinary drugs services; small farmers, traders, processing/export firms. The activities of the chain stakeholders in the process performance will be assessed based on the elements of quality management such as quality control, and quality assurance at the chain level that related to the requirements of the importers. The organization is generally considered as open systems that interact with their environments in the continuous process of transforming resource inputs into output products in the form of quality end products. Therefore, the role of institutional environment is needed in order to establish regulatory control programs to ensure the food quality and the wholesomeness at the primary production level. To do this effectively, the provincial extension centres and the departments of agriculture and aquaculture are important support channels for training, implementation of instructions and inspection.

5.2 Application to the practical problem

As already mentioned, one of the major problems of the Vietnamese Pangasius industry concerns organizing an effective fish supply chain quality management and the above discussed theories provide a useful basis for analyzing different organizational forms. In particular, the TCE explanation discusses three forms of governance structures: market, hierarchy and cooperative arrangements. We believe that spot/auction market relationship is not a feasible option to solve the current problem of the Vietnamese Pangasius industry. This is because if the processing firms purchase fish from the spot market, then the regularity of the supply will be compromised in the sense that the supply of quality and delivery of large quantities of fish cannot be guaranteed. This is especially true considering the specification made by the export market where they give more value to buyers who consistently supply fish.

On the other hand, to avoid the risk associated with quality and uncertainty of the fish supply, processing firms may opt for vertical integration, by integrating backward and performing the activities of the fish farmers.

Quality control is the operational techniques and the processes applied to fulfil requirements for quality (ISO, 1998). In the other hand, quality control involves both technological and management elements. Much of the focus has been on integral quality management system. These systems include all steps in the process performance such as the supply of raw materials, distribution, food processing, packaging, transportation and logistics, maintenance of production equipment and training stakeholders. In the chain quality management, quality control relates to supply control, production control, distribution control and process control. The input suppliers are crucial in the quality supply control. In this step, the small fish farmers can select suppliers who have the capability of supplying the good quality of fingerlings, feeds and veterinary drugs. Choosing input suppliers involves many factors. The small farmers should consider price, quality, location, past experience with the suppliers and service after sale. The next step of quality control is the production control at farm level. In order to control quality, the small farmers should use biological products instead of antibiotics in culture environment management. However, nobody can control the farmers' use of veterinary drugs when fish disease occur (own survey, 2006). Moreover, the small farmers should focus on the preparation of cage/pond and water resource to control fish quality. In the distribution stage, most quality problems at this stage are caused by traders. The processing firms are unable to control and manage most of the activities of their traders. Although the traders have a basic knowledge of the quality control and storage techniques, their knowledge is still limited. The traders use banned chemicals and other substances to treat fish materials before selling them to the processing firms (Khoi, 2006). Moreover, the traders usually use visual controls to inspect the colour, size and weight of Pangasius. Visual controls are an insufficient mean of detecting hazards (Khoi, 2006). In order to control traders' fish quality, the processing firms play a very important role in terms of instruction in maintenance techniques and quality control awareness. Moreover, the processing firms can make official contracts that specify requirements for fish material quality and that introduce attractive policies (support of capital, equipment, training and price information). The indicators of quality need to be clear to the traders in term of size, color and weight of the fish materials. In contrast, processing firms need to guarantee stable business for the traders in order to convince them to provide good fish material on a longterm basis. The process control is done in the processing/export firm. The processing firms have monitoring processes for a complete quality control of the Pangasius. The processing firms have to implement the standard prescribed by international quality standards. Nowadays (2006), most processing firms apply the HACCP approach for quality control to guarantee the product quality. After conducting the quality control in the supply chain, quality assurance is a feasible measure to improve fish quality in the quality management process.

Quality assurance refers to any action directed toward providing consumers with products of appropriate quality (Evan & Lindsay, 2002). On the other hand, quality assurance should provide confidence to customers and consumers that the quality requirements will be met (ISO, 1998). The objective of quality assurance is to guarantee that the highest standards of quality and safety are maintained. Quality assurance can be described as a control process (Luning et al, 2002). As in each control process, the quality assurance consists of four basic steps namely measurement, evaluation, corrective action and certification. Measurement involves evaluation of the system, which can be carried by auditing. An audit is a mean by which management can determine whether people in the organization are carrying out their duties and whether the organization is effective in meeting goals. Measurement should be done at each stage of the supply chain. Evaluation includes comparing to

standards. These standards can either be derived from the companies' quality policy and/or can be provided by external standards such as HACCP and ISO. Quality assurance is primarily aimed at giving both management and stakeholders guarantees about quality and quality systems. So quality assurance shows two faces – towards the own company it initiates corrective actions and towards external stakeholders it provides confidence and ensures credibility. Corrective actions include improving and changing the quality system in order to meet future quality requirements. Note that external pressure can force change-processes when companies feel obliged to meet external standards, such as ISO, in a relatively short time period. Choosing an adequate change strategy is very important in order to get control over these processes. And the last quality assurance stage is certification. The certification system is focused on the entire quality system. The most common approval is certification of the ISO-based quality system by a third independent institute. For example, in the Netherlands, also HACCP-based quality systems can be certified.

Currently, quality assurance programs, such as GMP, SSOP, SQF, BRC and especially HACCP, focus on assurance of safe food production. In Vietnam, the HACCP system is not yet applied in primary production due to financial, technological and managerial circumstances (Loc, 2006). Therefore, promoting farmers' cooperatives, training members in the production of safe and quality fish and strengthening their links to the processing/export firms are the incentives for improved fish safety and quality that meet market demand. In fact, almost all processing firms in the MRD have performed prerequisite programs (GMP, SSOP, SQF) to different extents, depending on companies' conditions in order to guarantee the conditions for applying HACCP. The success of the HACCP program depends greatly on the proper understanding of the HACCP principles by the chain actors. Therefore, the training on the importance of HACCP, the role of people in producing safe foods and how to control food borne hazards in all production stages is required (Barendsz, 1994; NACMCF, 1998). Currently, the vertical integration in the chain is shown by some processing firms can partly participate in quality assurance of Pangasius raw materials at farm level when they invest in farm (Khoi, 2006). Some big companies in the Pangasius industry such as AGIFISH, AFIEX and NAM VIET offer high quality inputs (feeds, veterinary drugs) and technical guidance (training) for small farmers, thereby reducing the uncertainties associated with input availability, quality and costs (Binh, 2006). The model APPU (AGIFISH Pangasius Pure Union) that was established in September 2005 is one of the representatives for vertical integration. APPU is a new model coordinating 5 member groups of the fish value chain, i.e. hatcheries, farmers, feed suppliers, veterinarians and processors in order to provide consumers with high-quality and traceable products. At the moment, APPU is considered as an effective model in reorganizing production, gaining members' commitment and responsibilities to supply foods of high quality and safety and improving the collaboration among members of the Pangasius production chain. The fish farmers of APPU follow SQF 1000 code to get the good quality of fish. The SQF 1000 code provides for the farmers a food safety and quality management certification program that is based on the HACCP system. This code provides a solution for small farmers seeking to effectively enter export the supply chain to implement a food safety and quality management system that addresses the needs of their customers. Certification requirements increase the cost of organizing small farmers. However, there are only nineteen fish farmers in the An Giang province who get the SQF 1000 code and this program is in the experiment period (DARD, 2006). Let's hope there will be more fish farmers following the SQF 1000 code in the future in order to guarantee the fish supply and quality for export.

Moreover, the formal organization is fisheries associations. This organization is a representation of the fish farmers and acts as the bridge between the small farmers and the processing firms to help them in terms of productivity, needs of market and negotiating with banks to increase the loan for the members (Binh, 2006). On the other hand, the informal organizations are formed by farmers themselves on the basis of genuine voluntarism and common interest. These informal organizations namely producer groups and clubs that are governed by representative boards, may play a role in improving the primary production of Pangasius. Members of these groups may help each other during harvesting seasons, borrow money from each other, establish fishery extension teams and share services. However, their importance remains uncertain because of their lack of legal status and support from local authorities in the region (Nhi, 2006).

- Quality improvement is the result of good quality management. Its goals include increasing customer satisfaction, achieving high quality levels, reducing cost, increasing productivity and accelerating the process (Luning et al., 2002). Quality improvement embodies the need for change, breaking through status quo. Quality improvement relates to technological improvement, managerial knowledge and skills and organizational behaviour on quality. In order to further improve fish quality and safety at the chain, a quality improvement process should be implemented. The processing firms should establish a bridge between their quality requirements and the activities of their chain stakeholders as well as with local authorities. Moreover, in primary production, processing firms can use the tools of supplier quality management and partnerships to achieve quality improvement and safety objectives Furthermore, the HACCP program must be applied in primary production and audited by the support organizations (NAFIQAVED and local authorities). These issues of quality improvement should be discussed at the meetings in which all fish companies and other chain stakeholders are involved. Organic experiment is one example of quality improvement. At the beginning of 2006, the Binca seafood Company from Germany invested in organic Pangasius production in the An Giang province. Binca has invested quite intensively in opening up its office and training facilities in the An Giang province in order to multiply the organic Pangasius production model that was introduced in the aforementioned pilot project. Binca plans to import 400 tonne of organic Pangasius from Vietnam in 2006 (Finken, 2006). The farmers who culture organic Pangasius following the strict guide of the application of production technologies by Binca seafood firm in using organic inputs without veterinary drugs. In the current market, there are few organic feed mills such as AGIFISH and CATACO, so far organic feeds are mostly imported from neighbouring countries such as China and Cambodia that results in increasing production costs (own survey, 2006). However, the farmers make a better margin with the organic products. They earn 15% more than in the conventional market and their outputs are secured by Binca company. But this model is in the experiment period with one farmers' group because of the high initial investment (PACA report, 2006).

In short, nobody (the small farmers, the traders, the processing firms, the government and the extension centre) can guarantee 100% quality in Pangasius materials, keeping them free from diseases, hazards and other contaminants, when even Pangasius controlled strictly by the company fall short due to uncontrollable hazards from fingerlings, feeds and veterinary drugs use. Solutions for Pangasius quality improvement should combine technological aspects with attention for the appropriate type of quality management. This should occur via the chain, from primary production to distribution. To do so, the industry support organizations should prioritize technology investment especially in the primary production of small farmers.

6. Conclusion and further research

This study represents one of the first empirical studies with regard to the upstream Pangasius supply chain quality management in Vietnam. It was aimed at investigating the relationships among vertical integration, quality management and business relationships of the Pangasius chain. Based on literature review, the research results generate some significant theoretical and managerial implications. This study contributes to the literature of the TCE and quality management by validating the relationships among vertical integration and quality improvement. It is deemed valuable as not much empirical study has been done in this sector so far. The quality of Pangasius is the result of all the activities performed and all the facilities and equipments used during production, harvesting, processing, distribution and export. Fish quality management directly affects the fish yield and quality, as well as the production costs and profit level of the fish farming practices. The processing/export firms should forge strategic partnerships and develop closer coordination relationships with their suppliers. Investment in quality management is crucial to improve customers' satisfaction and bring benefits for all the chain actors. A better coordination of activities between stakeholders in the Pangasius supply chain is recommended.

This study focuses on the relationship between the upstream parts of the Pangasius value chain. Further empirical research should be conducted to gain more insight into the relationship in the downstream part between the processing/export firms and importers or retailers. This will give a clear picture of the Pangasius value chain quality management.

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