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Quality management in the Pangasius export supply chain in Vietnam

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11 Concluding Remarks: Some Feasible Solutions

11.1 Introduction

This thesis addresses the research question of how to involve the *Pangasius* small-scale farmers in developing adequate quality management through the entire export-oriented supply chain. This chapter reviews the major research findings and conclusions of the chapters. Afterwards, feasible solutions at the farm level toward advanced production systems are discussed. The chapter ends with the conclusions to the main research problems and policy implications of the research results are drawn.

11.2 The major research findings and conclusions

Chapter 5 provides a general description of the actors in the *Pangasius* value chain. We found that the smallholders in the chain have weak linkages with input suppliers and processing firms. The inclusion of smallholders in export value chains faces major challenges regarding knowledge dissemination and access to resources (fingerlings, feeds, drugs, finances).

Chapters 6 and 7 focus on quality assurance. The results in chapter 6 reveal that quality assurance at export level and in processing firms meets quality requirements of export markets; however, there is no traceability at the farm level. Hence, the small-scale farmers and other actors in the chain must fulfill the quality requirements as they are formulated by the processing companies to make the chain operational. We conclude that the implementation of a fish quality assurance system requires an enabling policy and regulatory environment at the national and international levels with clearly defined rules and standards, establishment of an appropriate fish control system at the national and local levels, and provision of proper training and capacity building.

Chapter 7 describes how the processing companies deal with these requirements and pays special attention to how these requirements affect the relationship with farmers. We found that the processing firms are relatively well developed, as they apply a quality management procedure that is approved by a competent authority (NAFIQAVED) and the importers. However, the major challenge is to qualify fish products at the farm level to enable sales to high quality markets. The *Pangasius* processing/export firms must strictly control the quality of *Pangasius* not only inside the company, but covering the whole chain for traceability issues. This process is necessary to establish efficient coordination

among smallholders together and between smallholders and chain actors to improve their participation in global markets.

Chapters 8 and 9 focus on the actual production practices with respect to technology and quality control at the farm level. The analysis in chapter 8 shows significant differences in farming practices between APPU members, FA members, and individual farmers in terms of production technology applied. There are five main factors of production technologies at the farm level: (1) fingerlings, (2) stocking density, (3) feed and finances, (4) waste-water treatment ponds, and (5) chemicals/ veterinary drugs used for fish disease treatment. We found that the sources of fingerlings used by FA members and independent farmers lack certification. On the other hand, small-scale farmers use a higher stocking density, which leads to the reduction of fish growth, low survival rate, and more fish diseases when compared to APPU members. In addition, the findings also reveal that APPU members use industrial feed for the whole production cycle, while FA members and independent farmers still rely on home-made feed, which is not certified and tested. We found that APPU members applied advanced farming practices such as SQF 1000^{CM}, accordingly they receive the highest price at harvest. FA members receive more training and market information than independent farmers, and they have more motivation to apply advanced farming practices and therefore end up with better quality of fish and better market access than independent farmers. We also found that FA and independent farms have no waste-water treatment ponds. As a result, most of waste is discharged directly into rivers, and thereby contaminating the environment. Moreover, independent farmers mainly manage pond water based on their own visual observations, and do not use monitoring equipment. Therefore, disease outbreak is more common in pond farming system.

In chapter 9, we found that the main factor that determines the fish quality performance for export at the farm level is fish disease treatment. The farmers need proper knowledge of bacterial and parasite diseases. In most cases, fish farmers need the assistance of a trained pathologist to diagnose and treat a disease. In general, an adequate fish disease control system is needed so that small-scale farmers know how to respond to disease problems. The data results show that disease prevention and treatment are considered to be important by all farmers. However, some differences are observed: APPU farmers generally rate the importance somewhat higher (local zoning areas for aquaculture, local regulations of waste-water treatment, fingerlings health, quality of feeds, proper disease treatment following laboratory diagnosis, etc.). On the other hand, traditional farmers identify disease differently, based on their own experiences. However, farmers are aware of the importance of prevention and proper treatment, and they need more training and extension services to assist them in proper disease treatment. From the farming practices analyzed in chapters 8 and

9, chapter 10 presents farmers' awareness and willingness regarding advanced farming practices.

The analysis in chapter 10 illustrated that if the advanced system is completely adopted by a farm, the farm's profit improves via a higher selling price (APPU case). The FA members are more willing to adopt the advanced production system, as they are aware of the positive effects of improved farming techniques. We observe that the willingness to invest is high among farmers who are aware of the potential improvements.

From the data analysis, we understand that awareness among farmers is necessary to increase the adoption and to guarantee the success of the advanced production system. The next section suggests feasible solutions at the farm level toward adoption of the advanced production system. These solutions follow the ranking of obstacles that prevent the small-scale farmers from applying advanced production systems. Moreover, the suggestions of fishery experts for fingerling quality improvement, feed quality used, waste-water treatment, and disease prevention and treatment presented in earlier chapters are also discussed.

11.3 Feasible solutions for waste-water treatment pond

A waste-water treatment pond limits the discharge of sediment into rivers (chapter 8). The use of a waste-water treatment pond is the most difficult obstacle for small-scale farmers who have converted all their land into fish ponds (chapter 8 and section 10.4.3). The problem of a lack of land can be solved by encouraging groups of farmers to construct a common waste-water treatment pond by teaming up with farmers, or through government intervention. The condition for constructing a common pond is that the clusters of farm are in close proximity to each other and are dependent on the same water source. Survey results (2009) reveal that individual farmers are less aware of the environmental pollution compared to FA members (section 10.4.3). Independent farmers need more training and knowledge to gain awareness of this problem. For the sustainable development of the Pangasius industry, the environmental pollution is a very important issue and will require government intervention for a solution (chapter 2).

(1) Teaming up with farmers to construct waste-water treatment ponds

Encouraging and strengthening farmer groups will support waste-water treatment pond implementation. This endeavour includes the provision of assistance on a group basis rather than on an individual basis. Survey 2 (2009) shows that the pre-conditions for co-building waste-water treatment ponds are that farms are located rather close to each other and use the same water source. Small-scale farmers who do not have enough land can cooperate with

neighboring farmers. For example, three ponds of four farmers can be used for production, and one pond can be used as a waste-water treatment pond. Then, after harvesting, three farmers can pay back money to the farmer whose pond was used for waste-water treatment. Generally, farmers are willing to cooperate as they recognize some positive outcomes of waste-water treatment, such as reduced disease problems, increased fish quality, and productivity of farms (expert interview, 2009). Self-governed Pangasius farming groups must be formed in order to develop and maintain waste-water treatment ponds.

(2) Government intervention

Local authorities should develop a policy that prohibits pollution from farming systems. A strict administration in terms of environmental pollution is necessary to develop a more sustainable Pangasius industry. Penalties ought to exist for farmers who do not follow the rules of building waste-water treatment ponds. By working with farmer groups, enforcement of some regulations through its members is possible. The government regulation should be developed through inclusive participation of small-scale farmers. Farmer groups should receive training about the need to embrace such regulations and therefore become partners with the government in enforcement.

In addition, banks should support farmers who intend to construct a waste-water treatment pond with a favorable interest rate, and the local government should play a role in facilitating this procedure (see section 2.5).

Significant training and extension services are required for the implementation of waste-water treatment ponds, and for better management initiatives in the small-scale farming sector. The interventions will not be sustainable if they are not linked to the benefits of farmers and a shared understanding of their implications. The assistance of extension experts is needed to help small-scale farmers adjust their operations and behave responsibly in their cooperation. These services are needed for organizing the small-scale farmers into groups. Moreover, extension service is an important factor in keeping cooperation groups alive. Extension work can be set up in the community. In addition, internal regulations must be established and management responsibilities assigned within the farmer groups.

11.4 Feasible solutions for fingerling quality and stocking density

Analysis in section 10.4.1 reveals a lack of certified fingerlings on the market. The limited number of state-owned hatcheries cannot provide enough certified fingerlings to meet the large fish demand in the region (chapter 5). As a result, low quality fingerlings carrying germs of diseases are channelled to small-scale farms via uncontrolled sources (Surveys 1 and 2, 2008 and 2009 respectively). A

certified fingerling distribution network is necessary to provide small-scale farmers with better quality fingerlings. The establishment of one or more safe fingerling systems (private hatcheries, fingerling distribution by traders) is certainly necessary. In addition, farmers must cooperate in groups to obtain better access to certified fingerlings (table 10.4).

The problem of stocking density is different from the problem of fingerling quality. Section 10.4.1 indicates that a lower stocking density minimizes disease outbreaks and use of drugs. In addition, high stocking density leads to the reduction of fish growth, low survival rates, and more fish diseases (Phuong and Oanh., 2009). Small-scale farmers need more training and extension services to understand the benefits of a lower stocking density, which reduces fish diseases and environmental pollution. Training and information for farmers may be offered by extension services or feed/ veterinary drug companies. Moreover, training of NGO staffs to disseminate new stocking techniques will be required frequently. The staff should inform farmers about the effects of stocking density on water pollution and fish disease outbreaks.

(1) Certified private hatchery

The state-owned hatcheries maintain a system of record-keeping and quality certification. At the present, hundreds of small-scale hatcheries/nurseries do not keep such records. From the aquaculture perspective, small-scale hatcheries/nurseries in the long-term should aim to continue providing good quality fingerlings to commercial farms. They should be made aware of the importance of record-keeping and what information they should look for when purchasing brood-stock from other sources. A need exists for assistance in the development of hatchery certification programs for private sector fingerling suppliers.

A breeding project is needed to provide good quality brood-stock and high-quality fry and fingerlings. The multipliers of this brood-stock can be disseminated within the network of hatcheries to supply farmers with better quality fingerlings.

Farmers must be encouraged to ask for a certificate when buying fingerlings from private hatcheries/nurseries (APPU case). Currently, harmonized technical standards/guidelines for hatchery production and fry nursing are lacking (chapter 5). It is important for such technical standards to be developed, standardized, validated and agreed upon by the hatchery operators, both nationally and internationally and by large-scale and small-scale producers.

Fingerlings traders play a critical actor in the network, as they link private hatcheries/nurseries with small-scale fish farmers (chapter 5). They not only

facilitate the fingerling supply, but they also provide advice on fish farming to farmers (survey 1, 2008). They use boats to transport fingerlings to the farm gate. However, currently they collect fingerlings from many private hatcheries/nurseries that are not certified (expert interview, 2009). To change this practice, farmers must be encouraged to ask for certified fingerlings from the traders. Due to their important role, fingerlings traders need to be trained. They need to be able to prove the origin of fingerlings.

Governments are also encouraged to strengthen extension services and to develop, whenever and wherever appropriate, new channels (e.g., through private sector participants) for more effective delivery of such services. In addition, training and extension materials related to brood-stock management, stocking density, fingerling quality assurance, and distribution should be developed, updated, and disseminated. Parties involved in genetic improvement, fingerling production, and distribution should organize themselves into networks/clusters/clubs to share information/technology and other resources for greater efficiency and effectiveness. Moreover, local authorities are encouraged to promote, facilitate and provide incentives for the formation of such networks/clusters/clubs, including the setting up of local information centers.

(2) Cooperation for buying certified fingerlings

Section 10.4.1 states that farmers must order in large volumes when purchasing certified fingerlings. Therefore, farmers need to cooperate to buy certified fingerlings (see table 11.4). A group of farmers (such as FA members or a team of 4–5 farmers) can sign a contract with a state-owned hatchery to purchase certified fingerlings (expert interview, 2009). Under this contract, a group of farmers can make a plan for stocking time, production of required quantity and quality of seeds 45-60 days in advance. Through a consultative process, mutual agreement is formed between selected hatcheries and a farmers' group. These agreements concern better management practices to be used in hatcheries and other terms and conditions for production and procurement of quality seed. Although farmers must pay price premiums for fingerlings, they receive good quality seeds at the right time that lead to higher survival rates and more security of quality commercial fish.

11.5 Feasible solutions for feeds and finances

Section 10.4.2 reveals that small-scale farmers still use home-made feeds to save costs. Section 5.2.2 shows that waste from home-made feeds may cause environmental problems, leading to disease outbreaks. However, the survey results (2008) indicate that the biggest problem of home-made feeds is the instability of feed ingredients. This problem is caused by the use of trash fish. Trash fish is made of a combination of species of different age classes and

several aquatic organisms. As a result, trash fish is not consistent in quality. Moreover, the use of trash fish is a major concern from an environmental point of view, as it leads to the depletion of natural resources. Farmers need more training to be aware of the importance of using industrial feeds. One problem is that small-scale farmers purchase small volumes of feed, which is more costly than purchasing large volume (appendix 10.8). In addition, small-scale farmers have limited access to industrial feeds due to lack of capital. One solution would be able to cooperate in groups to purchase bigger volumes of industrial feed, which would give the farmer groups access to discounts as well (expert interview, 2009).

(1) Cooperation for larger scale of feeds purchasing

Analysis in appendix 10.8 shows that APPU farmers receive discounts when buying industrial feed in larger volumes. To improve the efficiency and purchasing power, small-scale farmers should organize commercially on a relatively large scale. If farmers buy feed collectively, the unit price of feeds will be cheaper. By doing business cooperatively, small-scale farmers will be able to increase efficiency, and accordingly, farm income. Presently, farmers who use industrial feeds can purchase feed from feed agents on credit (survey, 2009). It is necessary to organize farmers into groups to purchase feeds and thereby save on cost and achieve a more stable quality of industrial feed compared to home-made feeds.

According to Survey 2 (2009), the willingness of Pangasius farmers to use industrial feed is related to financial issues in practice (section 10.4.2). The access to credit is an essential factor for the sustainable and widespread adoption of using industrial feed in the whole production. This step requires substantial investments from the banks and possibly from feed companies. Principally, the banks give favorable credit (interest rate reduction) to farms that intend to use industrial feed. Moreover, feed agents should formulate a plan to support credit from farmers who use industrial feed.

Training is needed to change small-scale farmers' behavior toward using industrial feed. Cooperation and sharing of feed-practice experiences between fish farmers through effective extension services are important for small-scale farmers to get a better overview of feeding practices. Better motivation for small-scale farmers to use industrial feeds maybe also be required; for example, better prices for better fish would mean that processing firms are willing to pay for quality.

(2) Certified companies inspection

At the present time, many international and national feed millers in the MRD are attempting to obtain a share of the large fish feed market (refer to 5.3.10). One

major problem regarding quality of industrial feed is that the protein contents of feeds are lower than what is printed on the feed bag (Survey 1, 2008 and Survey 2, 2009). The local authorities have the responsibility of enhancing quality inspection of industrial feeds and certifying proper feed companies.

11.6 Feasible solutions for veterinary drugs used

Section 10.4.4 reveals that small-scale farmers still use illegal drugs for fish disease treatment. Section 5.3.11 states that illegal drug use continues to occur due to a lack of enforcement and control of the government's laws and regulations on veterinary drugs and chemicals. Moreover, farmers treat disease based on their own experiences and following drug sellers' advice, and they do not get proper disease diagnosis at a laboratory (chapter 9). FA members have more awareness in using certified veterinary drugs than independent farmers do (section 10.4.4). Therefore, small-scale farmers need more training and updated information on disease treatment and veterinary used. In addition, large amounts of banned antibiotics are available on the market. Inspection of drugstores is necessary to certify legal veterinary drugs. Moreover, government inspection is necessary to restrict imported illegal drugs (section 6.2.3).

(1) Certified veterinary drugs agents and government inspection

Currently, farmers obtain information on chemicals/ veterinary drugs through seminars organized by the veterinary drug providers who try to vigorously win over farmers and sell their drug products. As a result, enhanced inspection of veterinary production units, veterinary wholesalers, and imported veterinary products is needed. The reasons for improved inspection is that the use of chemicals that are not registered for aquaculture (but for human and livestock) are frequently used. Also, cheap antibiotics are widely available on the market. In many cases, products are not in their original packaging and are sold in a transparent plastic bag that may or may not be hand-labeled. Furthermore, no medicine administration records are kept. Therefore, to improve the proper use of chemicals/ veterinary drugs, the local authorities (fishery departments and extension services) should enhance the inspection of veterinary drug agents in terms of quality of registered aquaculture drugs.

At present, many farmers still focus more on treatment than prevention. Irresponsible use of antibiotics and chemicals in aquaculture leads to residue problems and to the development of drug resistance among the bacterial pathogens. Therefore, the extension services must provide more training on disease prevention in farming practices. Farmers must focus on using biological products instead of antibiotics in managing the pond environment. Moreover, the record-keeping of farming parameters such as daily mortality, health, disease status of the stock, growth rate, feed consumption, etc., is crucial in

understanding the symptoms of diseases. The collection of this historical data will help the veterinarian take early action in cases of disease outbreak. To do this effectively, provincial extension centers and departments of agriculture and aquaculture are important support channels for training, for the implementation of instruction, and for inspection.

As Pangasius are cultured for human consumption, it is strongly recommended that the use of antimicrobial drugs be strictly controlled by food and drug national authorities. Illegal drugs come mainly from China and India. They are imported by Vietnamese companies who sell the raw material. In Vietnam, no raw materials are produced (Mantingh and Dung, 2008). Therefore, better enforcement of the laws pertaining to chemicals/ veterinary drugs will improve the situation. On the other hand, it is necessary to promote more sensible use of prophylactic antibiotics in aquaculture, as accumulating evidence indicates that unrestricted use is detrimental to fish, terrestrial animals, human health, and the environment (Dung et al., 2008).

In short, the analysis shows some differences in quality control at the farm level between FA members and individual farmers in term of farmers' awareness and willingness. These differences are certified fingerlings, stocking density, certified feeds, waste-water treatment ponds, and certified veterinary drugs for disease treatment. Small-scale farmers must implement quality control systems at the farm level to gain access to the market. The farmers' experiences suggest that small-scale farmers must cooperate in groups to share the cost of infrastructure, water quality, and input quality.

11.7 Conclusions to the main research problem

The discussions in this thesis provide a clear answer to the problem of how to involve the Pangasius small-scale farmers in developing adequate quality management through the entire export-oriented supply chain. The findings show that problems of small-scale farmers involved in the export supply chain can be dealt with through developing business relations between chain actors. To develop a well-organized fish supply chain, it is crucial to encourage small-scale farmers to develop horizontal cooperation among farmers. Farmer group formation is necessary to enable farmers to make the transition from a production to a market orientation. Through the cooperation, farmers gain access to inputs, get extensions more easily, improve production quality, increase quantity, achieve economies of scale, and increase bargaining power with buyers. Farmers need to be trained, organized, and willing to innovate. This achievement leads to the improvement of farmers' awareness through increased information and knowledge, development of supportive policies, and quality control mechanisms (i.e., a better management practices system). Similarly, to

become more involved in the exporting chain, small-scale fish farmers must develop business relations with processing/export firms by entering into flexible contract farming.

In the Pangasius supply chain, the processing/export firms are generally the most powerful stakeholders, playing a leading role in organizing chain quality management. They get information on fish quality standards from the importers. Hence, the processing/export firms act as intermediaries, which means on the one hand, transferring requirements of importers to the small-farmers, and on the other hand, informing the importers with respect to production quality. Moreover, processing/export firms must be willing to do business with some degree of commitment, allowing small-scale farmers to improve their business performance by learning from their mistakes.

The processing/export firms realize that the quality of fish materials is a very important factor that affects the quality of finished products. However, in practice, the companies do not satisfy quality requirements of fish materials, due to the lack of conditions to control the quality of fish materials. This defect is particularly problematic for processing/export firms, as they must transform a heterogeneous input of raw fish material into a uniform output of quality products. In addition, raw fish material comes from many different small-scale farmers. In fact, the processing/export firms have a double coordination problem. Aside from the need to align their processing activities with the production activities of small farmers, firms must coordinate the production activities of many different and independent small farmers. To solve these problems, the processing firms can conduct vertical coordination with farmers or contract farming with fishery associations.

The role of government is necessary to enable the private sector to organize its supply chains to involve smallholders. The task of government is to provide a well-functioning market, for instance, by providing small-scale farmers with information on demand, supply, and prices. Moreover, governments have supported small-scale farmers and producer organizations through NGOs. It is necessary to support fishery association/ groups of farmers by linking with university researchers who can provide training for advanced farming practices to the needs of farmers.

Government can contribute to providing an effective and enabling farming environment that includes introducing regulations that relate to food safety and quality, and providing arrangements to certify input quality. To implement these activities, law enforcement is needed, which implies a well-functioning official system. If the official system does not work properly, farmers may be reluctant to enter into exchanges. Moreover, governments can enhance the effectiveness

of fishery associations' participation in international consultative policy processes by helping them gain access to information and providing funds to recruit experts to include input in the policy dialogue.

In short, the cooperation types of horizontal and vertical coordination are needed, not only to increase bargaining power of small-scale farmers, but also to create more options for processing/export firms. In our research, horizontal cooperation is important when farmers become involved in the export-oriented chain. Moreover, vertical coordination is suitable for improving the socio-economic performance of small-scale farmers, thus reducing the gaps in the supply chain performance. Vertical coordination is the preferred strategy of farmers. Cutting out traders and other intermediary agents would shorten the chain.

11.8 Some recommendations for policy makers

- Local authorities should make efforts to stabilize the price of fish, provide further financial support to farmers, and facilitate the organization of associations/groups of fish farmers.
- The government should improve the zoning of Pangasius farming areas. They should also provide quality control, testing, and planning for farming areas with treatment outlets for water.
- Aquaculture extension services should organize further training courses on disease prevention and treatment.
- Processing/export firms should provide information to help farmers plan production cycles. This provision would stabilize market output, help farmers to assess fair prices, and enable them to better cooperate with other farmers.
- The private hatcheries should stabilize the supply of quality fingerlings by increasing investment in seed production.
- Fishery association should take a stronger lead in providing access to credit and take more responsibility for facilitating the transfer of new technologies and techniques.
- Veterinary product sellers should provide correct chemicals and veterinary drugs for small-scale farmers. Clear information on the sources of the medicines should be provided and training workshops should be given frequently to develop awareness and skills across the Pangasius industry.
- Universities/ research institutions should provide further information and training to farmers. They should also carry out research on fish diseases and waste-water treatment technology, as well as research on improved quality of fingerlings and home-made feeds.

- Farmers should either change the size of their production to become more profitable or advance to fingerling production in case they have only one small pond.

11.9 Further research

For a better understanding of the different actors in the entire Pangasius chain, detailed information on the primary production stage (hatcheries, farms, collectors, and wholesalers), the processing stage, and the distribution stage is required. The focus of the current research is on the farming stage, with an emphasis on the implementation of quality management at the farm level. Some attention is paid to the processing and distribution stages.

Further research is also necessary for a better understanding of the relationship between quality and different types of price and non-price incentives. Important also, is understanding how the creation of value added through the chain and its relationship to benefit distribution among chain actors can be influenced in an indirect way by focusing on quality improvement in particular stages of the supply chain.

Only a few studies describe the relationship between smallholders and large processors (i.e., Key and Runsten, 1999). However, the options for contract enforcement still remain unclear; smallholders easily break the contract whenever they receive better offers from other processors. Relational contracts and self-enforcing contracts appear to be useful mechanisms for strengthening buyer-seller relationships. Different flexible contracts are used as incentives to promote mutual relationships, simultaneously improving the quality of the produce and reducing opportunistic behavior.

The author strongly advises further research into the following topics:

- ❖ Research on Pangasius brood-stock quality management and its impact on the quality of fingerlings and on final Pangasius products
- ❖ Research on the implications of further vertical integration by processing companies through certification schemes such as Natural and Global-GAP, and production clubs such as the APPU for small-scale farmers
- ❖ Research on consumer preferences with respect to the variability in quality and the related techno-managerial decisions throughout the Pangasius chain

These research topics will be very useful for Vietnam's fisheries industry, the local authorities, VASEP and NAFIQAVED, and other chain stakeholders as well. This research will help improve fish quality and safety through an improved chain quality assurance system.

