
Aquaculture Market and Development Strategy: The Case of Pangasius in the Mekong Delta, Vietnam

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Abstract

Vietnam Mekong Delta plays very important roles in fishery production with its total of 60 % by the country's production and its sharing of the 80% of the National fishery export, with its around USD 2.5 billions, annually. The Pangasius (ca tra) is the main product of the fishery production in the region. However, this fishery production has also faced with some problems of its environmental changes, its trade dispute, and its production and marketing. Therefore, the aims of the study as follows: (i) To analyze the pangasius development by the changing environment; (ii) To identify influence of trade dispute on the pangasius farming characteristics; (iii) To provide development strategies for this production effectively. This study's methodologies by the secondary data and primary data's collection of different stakeholders of the pangasius's supply chain analysis in the Vietnam Mekong Delta.

In order to improve the catfish production in the Vietnam Mekong Delta, the catfish production zoning and its best quality control, its supply chain development, balance of its supply-demand, and improvement of farmers' technologies and their organizations are strongly recommended.

Keywords: pangasius development, supply chain, development strategy

1. Introduction

Since 1986, Vietnam has significantly reformed its centrally planned economy into a market oriented economy through the Doi Moi (renovation) policy. Progress in trade reforms has been rapid. Trade restrictions were gradually removed. In the process of trade liberalization, the government has increasingly appreciated the potential and the value of fishery products. The share of agriculture in Vietnam's Gross Domestic Product (GDP) has gradually reduced, but the same share of fishery increased from 10.25% in 1995 to 12.55% in 2004¹.

During the implementation of its policy of economic transition, Vietnam has paid much attention to the re-organization of the rural market. Vietnam's rural area plays a key role in the strategy of economic development, as more than 50% of the exported products have their origins in agriculture and in fishery.

The Mekong Delta (MD) in the southern part of Vietnam covers 12% of the total area of the country and is a major source of Vietnam's aquaculture production². At present, the MD has about 12,100 fishery farms, accounting for 72% of the whole country. The export value of these fishery farms account for 54.34% of Vietnam's total exports and contributes significantly to rural employments and to the increase

in income of more than 6 million people³ in the MD. In this process, aquaculture and the exports of the MD are playing an important role.

The most important freshwater aquaculture product in the MD region in particular, but also in the country, is no doubt the two species of pangasius cultured in Vietnam, namely basa (*Pangasius bocourti*) and tra fish (*Pangasius hypophthalmus*) (see Figure 1), showing a very high growth rate both in terms of area and production levels. The total production of pangasius in 2006 was about 286.7 thousand tons, 10 times as much as in 2002, and representing approximately 56%⁴ of the total freshwater aquaculture production of the MD.

Unfortunately, the development of aquaculture still has many problems. Growth is unstable from the production to the processing phase. Moreover, the existing master plan is unclear, while the access to the export markets is hindered by many legislative and technical trade barriers.

The objectives of the present paper are:

- To analyze the pangasius development by the changing environment
- To identify influences of trade disputes on the pangasius farming characteristics
- To evaluate the performance of policies

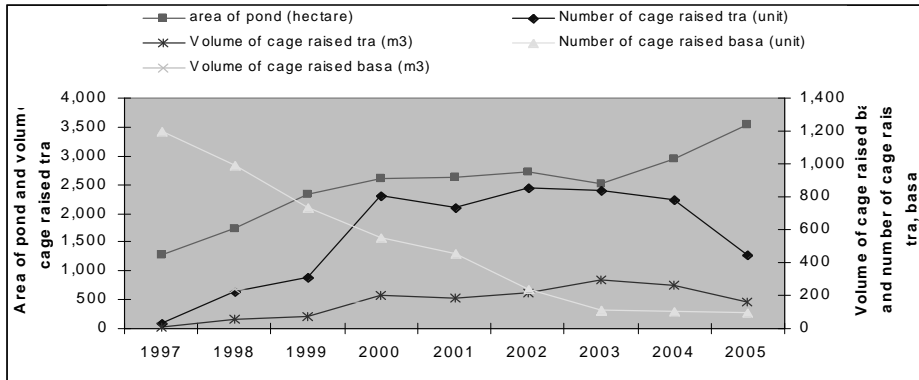
Figure 1: Species of Pangasius (fresh water fish) in the Mekong Delta



Basa fish (*Pangasius bocourti*)

Tra fish (*Pangasius hypophthalmus*)

Figure 2: Pond area and cage volume for basa and tra fish production



Source: Provincial Department of fishery in the Mekong Delta (An Giang, Can Tho, Dong Thap, Tien Giang and Vinh Long province).

- To provide development strategies and recommendations

2. Growth of the Vietnamese pangasius industry and its changes

The expansion of markets and demand led to increased development of basa and tra fish farming. As Figure 2 shows there was a sub-

stantial increase of catfish production in 2000, as many fish farmers had started catfish culture in cages. However, this quickly declined after 2004, when the pond areas were expanded, its reasons can be seen more clearly in Figure 3.

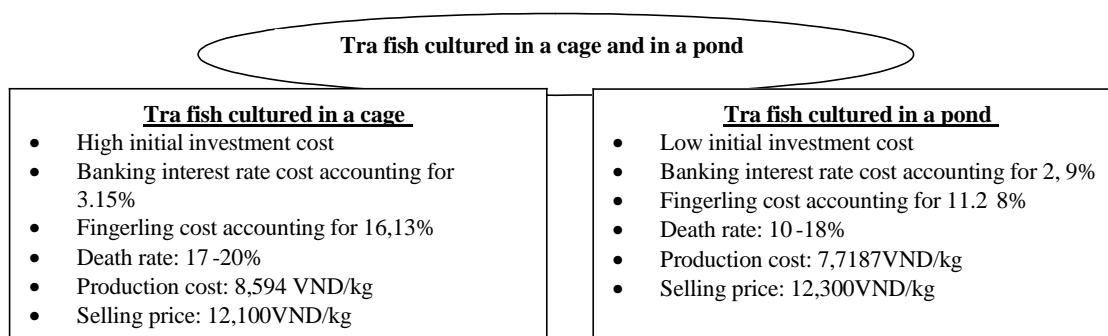
Due to the successful improvement of production technology, compared to the quality of

Figure 3: Benefit comparison of the basa and the tra fish products

| Comparison between the basa and the tra fish production | |
|---|---|
| <p style="text-align: center;"><u>Basa fish</u></p> <ul style="list-style-type: none"> • Raising duration: 12 months • High initial investment cost of tra raised in cage • Average production cost: 10,700VND/kg • Fingerling cost: 3,500VND/fish • Average death rate: 30% • Rate of fillet: 4kg of live fish produces 1 kg of fillet • Selling price of live basa fish: 13,300VND/kg | <p style="text-align: center;"><u>Tra fish</u></p> <ul style="list-style-type: none"> • Raising duration: 6-7 months • Low initial investment cost of tra (case of tra fish raised in pond) • Average production cost: 8,636VND/kg • Fingerling cost: 500-1,500VND/fish • Average death rate: 25% • Rate of fillet: 3 kg live fish produces 1 kg of fillet • Selling price of live tra fish: 11,500VND/kg |

Source: Own survey - carried out from October to November 2002 in provinces in the Mekong Delta: An Giang, Can Tho and Dong Thap.

Figure 4: Efficiency comparison of tra fish cultured in a cage versus cultured in a pond



Source: Own survey - carried out in An Giang province on June 2005; The daily price news of An Giang DARD from January 2004-August 2005.

finished tra fish compared to the quality level of the finished basa fish converged, making its production more lucrative given its lower costs.

Unlike the ecological characteristics of the basa fish, only raised in net cages anchored on rivers the tra fish has been raised both in ponds and in cages. As Figure 4 clearly shows, the share of the live basa accounted for 42.2% of the total quantity produced in 1997 and fell to 1.29% in 2005, while the share of the pond tra in the total quantity produced was 56% in 1997 and increased to 89.3% in 2005. The increase in the quantity of tra produced and the fall in basa production was caused by technique improvements on tra fish, particularly pond raised tra, becoming more profitable than basa fish.

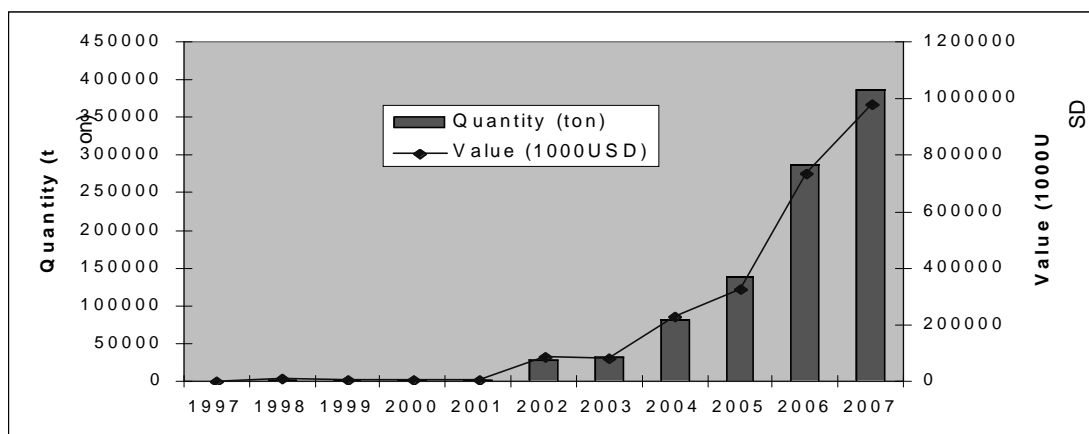
Based on using modern technologies, and applying progressive models in farming, together with strict environmental controls implemented by provincial authorities, fish farmers have currently reduced the death rate in culture. Thus, compared with Figure 3, the

death rate of the tra fish cultured in ponds is from 10%-18%, and of the basa fish cultured in cages as 17%-20% (see Figure 4). This is a good opportunity for fish farmers in the MD to restrain the production costs, while the market price of some input materials is increasing, such as e.g., the fish feed price⁵.

The total production area (pond and fence) of basa and tra fish in the MD has been increasing continuously at an average annual growth rate of 32.8% from 1997 to 2005, in contrast to the average annual growth rate of live fish of 13.5% (see Figure 5).

With the growth of the farming area of pangasius, out of line with the companies' processing capacity in the MD, a dramatic lack of balance developed between the supply of raw material fish and the processing demand of fish, particularly between 2003 and 2005. It is true that many processing plants have been established in other regions than the MD, e.g. in Ho Chi Minh City, but the selling price of the fish farmer at the farm gate has not improved much, due to the increased trans-

Figure 5: Vietnamese pangasius exports



Source: VASEP and www.fishtenet.gov.vn

portation costs. The significant growth rate of farm-raised pangasius is very much affected by the expanding export market. The export market accounted for almost 90% of the total quantity of live pangasius in 2005, up from 35% in 1997. The growth in volume of exports has been accompanied by an increasing farming area and raw material of pangasius.

Total Vietnamese pangasius exports have increased from 425 tons in 1997 to 27,987 tons in 2002 (before the trade dispute, see Binh, 2006). In 2006, this volume jumped to 286,600 tons, equivalent to 736 million USD. Now, there is around 2 millions USD (2010). There is also evidence of an expanding role of pangasius products in international whitefish markets, reflected in the increased penetration of the European retail chains⁶. Whereas the USA accounted for more than 50% of Vietnam's pangasius exports before the trade dispute, the EU accounts for the greater share of Vietnam's exports of pangasius after the trade dispute, particularly in 2006. Some of the reasons that

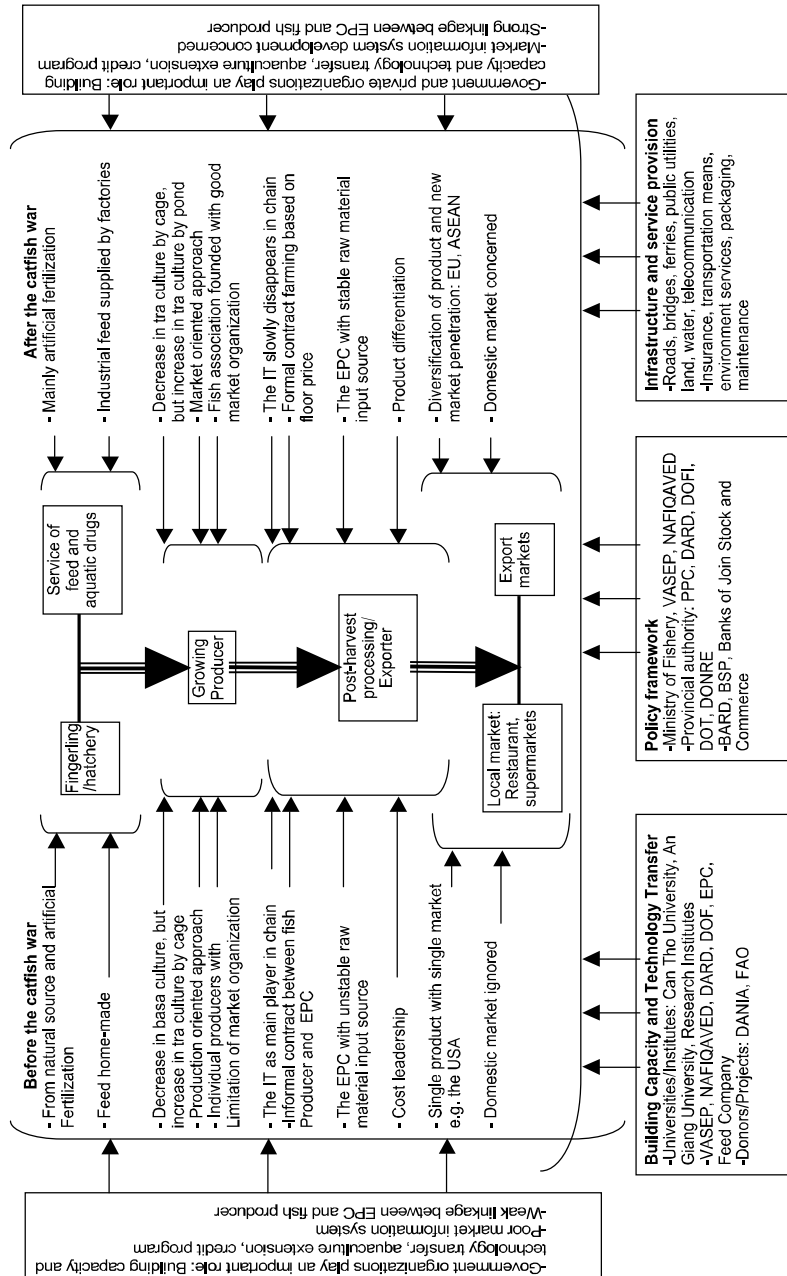
are responsible for the higher growth rates during the recent years are:

- Synergy between the fish farmer and the processing plant based on their agreement on application of SQF 1000⁷ by the farmer, and SQF 2000 by the processing plant, with antibiotic residues, e.g. Choloramphenicol, Malachite Green not being allowed in fish products.
- An increase in international demand due to consumers substituting fish for meat meals.
- Processing plants have improved technology to meet hygiene and food safety at a reasonable price, with diversifying products and expanding market places based on market oriented approach.
- The bird flu outbreak in Asia drove Europeans to opt for fish rather than for poultry meat.

3. Market chain of pangasius and its change

In Figure 6 the value chain before and after the trade dispute is depicted and has been developed to support policy decision markers

Figure 6 The value chain of pangasius product before and after the catfish war



who trigger development, particularly for aquaculture cultivation. Each link of the chain shows central activities and their respective stakeholders who perform these activities. However, the interactions between stakeholders have changed during the trade dispute. For instance, before the trade dispute, the intermediate trader (IT) was a major player in the market channel to ship the product from the fish producers to the exporting and processing companies (EPC), but his role slowly disappeared. Some of them become brokers after the trade dispute war, with the EPC now directly collecting the product from the fish farmers.

Moreover, before the trade dispute, the fish producer was usually linked with government organizations through programs of capacity building and technology transfer, but were facing severe limitations in the field of market organization and market information communication. After the trade dispute, however, the situation changed dramatically as the fish producers were not only supported by government organizations, but also by private sector organizations (e.g. private export companies and private feed factories). Since the end of the trade dispute, fish farmers are benefited from various programs, among them credit programs, programs of capacity building, technology transfer, aquaculture extension, market information, etc., whereas on the output side fish farmers' were involved through contract farming.

It will be remembered that technology transfer, aquaculture extension, capacity building, market information, credit support and contract farming are the result of the linkages between the EPC and the FF. However, during the 1997-2002 period no clear linkages existed among the FFs, between the EPC and the FF;

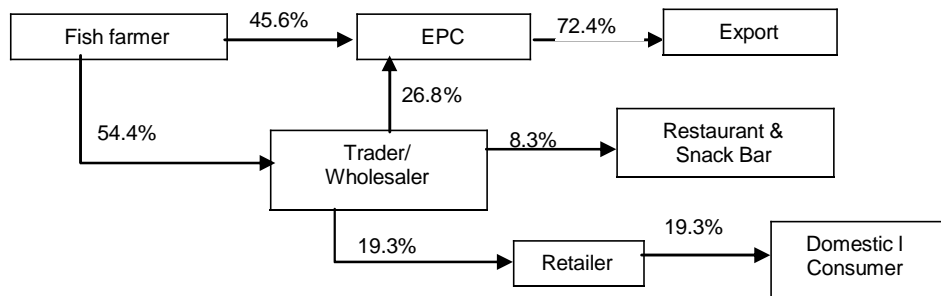
and among the EPCs, therefore technology transfer, aquaculture extension, etc. were extremely limited. Moreover, EPCs were not cooperating in capturing foreign markets, but in contrast, often were engaged in cut-throat competition.

After the trade dispute, however, cooperation between the EPCs improved considerably. VASEP is a successful model to gather exporting members, of which the pricing strategy is concerned when exporting to the world market, e.g. minimum limitation sets up the price strategy without uniform. Many business promotion programs of the EPCs were set up with the FFs. Initiatives of capacity building, aquaculture extension, credit support, farming clubs, contract farming, modern production and technology transfer were spreading, which made the EPC feel secure that the raw material market would meet the needed quantity for processing. At the same time, production costs could be reduced, together with the traceability process of original product, in line with the international standards and consumer demand.

Market channel description

Before the trade dispute, the intermediate trader (IT) was an important link between the fish farmer (FF) and the EPC. More than 50% of live pangasius of the FF was directly sold to the IT (see Figure 7). Business functions of the IT were collecting and trading products like a collecting trader. Using its own boat, the IT also shipped the live pangasius product from the farm gate to the processing plants to earn the difference between the purchasing and selling price. This market channel structure is consistent with the initial stage of the Vietnamese pangasius industry development, as the farming scale of the FF was small and production and processing was done at a distant place. The

Figure 7: The market channel of pangasius before the trade dispute



Source: Authors survey conducted in 2005

farmers were communicating mostly with the local IT and strongly hesitated to deal directly with the EPC.

Although during this period the collecting function of the IT was required, the FF faced many disadvantages:

- The FF had few opportunities to look out for external markets, and showed little motivation to improve the fish quality.
- The transfer of farming technology from the EPC to the FF was very small, due to very limited contractual or communication links between the EPC and the FF.
- The risk of price instability was a continuous threat to the FF, depending on the IT rather than on the EPCs.
- The selling price of the FF depends and is usually controlled by the IT who always tries to push the buying price down.
- The IT's financial ability to pay the FF after having purchased the product was often very limited. In addition, payment was often made too late. Some IT tried to extend the payment time to the FF.
- When buying the live fish from the FF, the IT does not have real quality evaluation criteria, and is mostly negatively evaluating the pangasius quality. As a result, the FF loses its

benefit when selling its own product, since the selling price is lower than the real value of the pangasius quality.

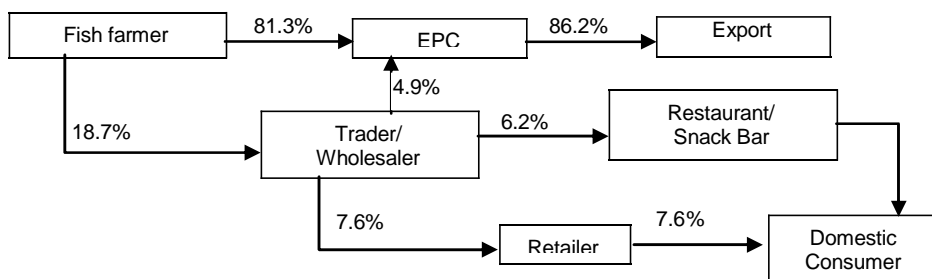
- The FF's profits went partly to the IT and the IT's share in the gross marketing margin, amounted to 12.12% in the period before the catfish war (compared to 2.9% after the catfish war).

After the trade dispute the marketing channel picture changed dramatically, not only in the farming technology, but also in the consumption structure. With the spread of market liberalization, small scale FFs were replaced by large scale FFs with sufficient financial backing. The function and the business role of the IT reduced considerably to slowly disappear in the market channel as a comparison of Figure 7 and Figure 8 shows.

After the trade dispute 81.3% of live pangasius were directly sold to the EPC and only 18.7% to the IT. These changes also caused more synergy between the FF and the EPC through contract farming. The new market channel structure created the following advantages:

- Production by the FF is market oriented
- Small scale farmers were replaced by large scale farmers who can meet the EPC's

Figure 8: The market channel of pangasius after the trade dispute



Source: Authors survey conducted in 2006

contract farming conditions both in terms of quantity and quality.

- Large scale farmers can easily apply modern farming technology.

- Through direct selling to the EPC, the FF can avoid the IT's price negotiation and quality evaluation about the live fish offered, thereby undermining the bargaining power of the IT and reducing marketing margin. Consequently the marketing margin of EPC has increased.

- Large scale farming by individual FFs within the same region also brings important external economies of scale, related to collecting the production and to services provided by the local authority (aquaculture extension programs, capacity building policies and environmental management and control).

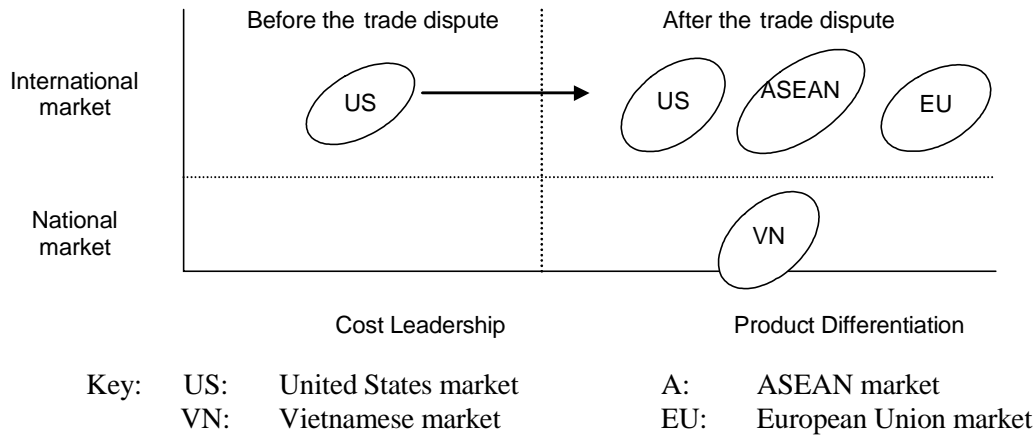
4. Group strategies of Vietnamese exporters

During the period before the trade dispute (1995-2002), the Vietnamese export and the processing companies have produced and distributed catfish fillets under a strategy of cost leadership through experience, the advantage of natural potential and intangible resources, such as skills and the experience of people. This strategy was successfully applied in the USA as the main export market of Vietnamese exporting and processing companies (see

Figure 9). At the same period, added value products for the domestic market are ignored by the companies, while domestic consumers consume tra and basa fish based on traditional cooking, unprocessed. However, after the trade dispute, Vietnamese exporters have seen many competitors, e.g. China. So they have developed a strategy of production differentiation through value-added products based on quality, safety, design, reliability, ease of preparing and taste. In parallel, the advertising levels of these companies also tend to be high for using this strategy. The strategy in this case is used popularly in the international market as the USA, ASEAN and Europe, and in Vietnam.

There are two approaches of the pangasius industry in the Mekong Delta. The first approach is the "production-oriented approach". This was the dominant approach in the period before the trade dispute. The policy focused on the production input and on fish farmers. It tried to bring farmers in contact with production technology, and with targets that increased the production and decreased prices to attract consumers. Besides this, technical information was provided, which required substantial financial support from the public sector and from donors. In the period

Figure 9: Strategic groups of the Vietnamese producing industry



after the trade dispute, there was a shift towards a “*market-oriented approach*”. The policy focused on outputs and on the needs of the market, and aimed to strengthen commercial linkages between farmers and markets. It also targeted market failures and marketing inefficiencies. Particularly the production was based on market demand and always calling for new skills, while the profitability was enhanced by increasing production and prices.

5. Evaluation and discussion of performance of policies implemented

5.1 Master plan

5.1.1 Positive responses

The Ministry of Agriculture and Rural Development (MARD) remains responsible for sector planning, though the detailed planning is undertaken at the provincial and the lower administrative level in with the government decentralization policies. The master plan 1999-2010, issued by Decision No 224/1999/QD-BTC in 1999, was promulgated to set up objectives for the sector’s development. However this master plan has recently been reviewed, due to a rapid growth of the

pangasius industry and the environmental and the natural resources protection issues. Another master plan for fishery development from 2006 to 2010⁸ and orientation towards 2020⁹ is also granted, issued by Decision 10/2006/QD-TTg approved by the Prime Minister.

The government intends to build up the pangasius farming area (known as a master plan), not only contributing to protect the natural resources, to deter the threats of the increases in environmental pollution, but also reducing the fish farmer’s risk and meeting the international quality standard. The master plan can open potentials first by ensuring a stable fish fingerling supply through the fish hatchery development programs, and secondly by avoiding negative price fluctuations, due to occasional supply gluts. Based on the gathered farming plan, the local staffs, e.g. of Department of Agriculture and Rural Development (DARD) in An Giang, directly help fish farmers take account of farming techniques, in which extension services and disease prevention of fish are included. The way to transfer the farming techniques from organ-

izations (DARD, company) to farmers can be seen later.

5.1.2 Risks and challenges

The fact that many farmers did not hesitate to enter pangasius farming, is a positive sign of the development of the Vietnamese pangasius industry. However the reverse side of this is potential environmental decay, because the ecological system is abnormally attacked by people's investments, by not obeying the master plan drawn by the provincial government.

The local staff force specialized in environmental issues is limited in quality and quantity, consequently the environmental control system of the local authority is unable to completely manage production activities not only in the farming system, but also in the industry. Although the master plan is, step by step, concerned by the local authority, this does not take enough consideration of environmental and disease issues.

According to the survey results based on expert evaluation, the master plan implemented at the province level lacks good coordination between the responsible departments¹⁰. Illustratively, the master plan requirements are large, while the financial ability and the human capital to support do not meet a target. In addition, infrastructure requirements consisting of irrigation canals, the construction of dykes against floods, pumping stations have not yet been developed completely.

Normally the local authority applies the master plan by following one decision of the central government, e.g. instructions and a long term national development plan, but not concerning the idea collected from the farmer and the commune official. This is the reason why some master plan does not meet the rural and social development. So the master plan

sometime must be revised. This is also a problem because the implemented master plan and the farmer's following it, do not absolutely meet the same point if market demand moves in the wrong direction.

5.2 Environmental management and control

5.2.1 Positive responses

The local authority has granted policies relating to environmental management. A rearrangement of the pangasius raised in cages anchored in rivers was given a lot of attention. Evidently, the distance between the cages is orderly and scientifically adjusted. When the farmer has the approval of an occupation certificate, then he or she can continue to farm, otherwise he or she has to stop. Similarly, also the pangasius farming areas by pond are monitored.

The government propagates and encourages that the farmer be conscious about the type and quantity of chemicals used. It is a big problem if the chemical overuse is discharged into the rivers. Also the local authority manages the industrial waste of processing plants, in order to deal with the required factor to reach the environment protection laws.

5.2.2 Risks and challenges

The rapid growth of the pangasius industry has raised a number of environmental concerns. Based on the expert evaluation conducted in 2006, five key issues relative to water pollution are identified (e.g. waste of company; waste of crops of rice and fruit; waste of people; flood). Although the government presents policies concern on the environmental protection and on the legislation to supervise the processing plants, there is still a lack of awareness and of compliance of those plants. The waste from processing plants has been not treated completely, and has been flushed into

the river. It causes epidemic diseases spreading in pangasius in the region, and threatens the farming effectiveness.

Most farmers (of rice and fruit) use high levels of inputs (e.g. fertilizer, pesticide and other chemicals), but do not know the correct recommendations and the application strategies. Dangerous agricultural chemicals can produce contamination of the soil and the water. Also the suppliers of these inputs are often unaware of the use of those chemicals. These problems have been exacerbated because the official extension and research services are currently unable to provide adequate advice.

The farms are sometimes constructed outside the legal framework. Evidently, more and more pangasius growers appear in the MD, who are not complying with the legislation of the master plan under the local authority. As new farms are established, the sensitive habitat can be destroyed and the water is often diverted, which can affect other water users and also the environment. Excess waste can pollute the water and negatively affects the plant and the animal habitat.

Not only in agricultural farming, but also the aquaculture, the use of fish meal, fish oil, trash-fish as pangasius feed is diminishing the food sources that other fish rely on. Also, feeding trash-fish to the pangasius can cause unsustainable harvesting and water pollution. Inappropriate use of antibiotics and chemicals can cause unintended consequences on the environment and on the human health.

The water may be polluted by other activities than aquaculture as well, especially in the neighbourhood of factories. Waste from the people living on the bank of the rivers is also an essential point for the provincial govern-

ment, because of a lack of finances to resettle a resident to protect the environment. Low awareness of this community is a potential problem, not only for themselves who are daily using water, but also for the animal habitat. Also the annual flood is, of course, not excluded, because it brings many epidemic diseases, for the people as well as for the aquaculture.

5.3 Food safety and hygiene policy

5.3.1 Positive responses

The Vietnamese Government has instructed the ministries and the agencies that are related to the aquaculture and the processing industry, to strictly observe control regulations on the use of antibiotics and other chemical drugs in fishery production and trading, not only for the export but also for the domestic market.

Decision No 7/2002/CT-TTg issued in 2002 by the Prime Minister was to strengthen the control of antibiotics used in the producing, the processing and the trading of foodstuffs that are harmful to human health. The MARD is mainly responsible for monitoring and supervising, also compiling a number of documents relating to the guidance of legal aquatic drug use, while the National Fisheries Quality Assurance and Veterinary Directorate (NAFIQAVED) is directly responsible for the management.

The NAFIQAVED is entrusted to be responsible for the control and the supervision of the general aquatic drugs and the feedstuffs production for farming, raising and treating fisheries problems. Control measures are executed in the whole farming process.

For export products with antibiotic residue surpassing the allowed levels, Vietnam's relevant authorities have carried out an investigation (based on testing samples selected at ran-

dom) into each stage of the whole process, from the farming to the final product.

The MARD has set up an executive board to supervise the raising and the processing of tra and basa in a move to help struggling exporters. The board has 11 members representing the MARD, the Vietnam Association of Seafood Exporters and Producers (VASEP) and major pangasius farming provinces like An Giang, Dong Thap and Can Tho. In parallel, the VASEP Freshwater Fish Committee (VFFC) was founded in 2005. Members are EPCs, such as AGIFISH, NAVICO, VINH HOAN CO, MEKONGFISH-CAN THO, HUNG VUONG CO. The aims are to get the EPCs closer to gain a prestigious fresh water pangasius quality and a trademark on the world market. Also the VFFC develops a close marketing linkage with the fish farmer to secure the benefits for both sides and to protect the environment further to the sustainable development.

Encountering an increase in technical barriers and stern demand of the world market, some EPCs (e.g. AGIFISH, AFIEX, NAVICO, VINH HOAN CO) create their own organic pangasius farming union, together with the set up of an input logistic system (i.e. fingerling, feed and general aquatic drugs that EPCs are responsible to supply the fish farmer), which can help companies to reach the traceability of the product. Representatively, the AGIFISH officially sets up the “AGIFISH Pure Pangasius Union” (APPU), which is supported and facilitated by the VASEP. The APPU is an organization allied by five sectors: the fingerling hatchery centre; the fish farmer; the general aquatic drug enterprise; the feed factory; the EPC. Objectives are (1) to guide and to assist the fish producers to apply the technical production process according to the SQF 1000

and to other standards such as the EurepGAP¹¹ and the BAP¹²; (2) to help the fish farmers to work with advanced technology to prevent epidemic fish diseases; (3) to contribute positively to the environmental protection and to guarantee social benefits for the fish farming community.

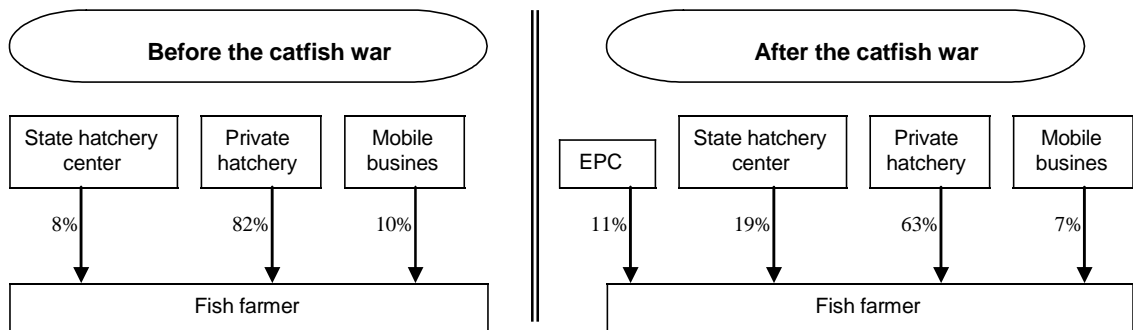
A model for organic pangasius farming was set up by the Binca Seafood Company (Germany) in the An Giang province, with a low density stock and with organic feed. Presently, there are few farmers enrolled, due to Binca company’s strict criteria and limitation of the market demand (high income group) for high quality fish with high price. The yearly formal contract is signed between the fish farmer and the company, and is a positive sign for the organic pangasius, going as far as e.g. farming contracts of 600 tons in 2005 and of 1600 tons in 2006.

5.3.2 Risks and challenges

The Fingerling quality is one of the important factors that the EPC and the fish farmers always are concerned about as well, because it involves the viability, the quality and the hygiene status of their stock. This is translated into a higher quality finished product. Based on two surveys, conducted before and after the trade dispute, it can be concluded that the quality of the fingerling has not yet met the fish farmers’ demand. Whereas almost 30% (including the state hatcheries and the EPCs) were meeting the fish farmer’s demand after the catfish war, this percentage was only 8% before the catfish war (see Figure 10).

Mostly of the fingerlings of the private commercial hatcheries and the mobile fingerling suppliers (who use their own boats directly transporting the fingerlings to the fish farmer) occupied the largest market share.

Figure 10: Fingerling procurement of fish farmer



Source: Authors survey conducted in 2002 and 2006

Their fingerlings are not of a clear origin, not of a uniform size and not of strong health, and the fish farmer’s qualification and their knowledge on these fingerlings are limited. About 82.1%¹³ of individual fish farmers, who are not members of any club or association or union, must face this disadvantage of a bad quality fingerling source.

The gap between a domestic valuation of the quality pangasius done by the Vietnamese exporters and an extremely strict quality measurement tested by the countries importing pangasius (e.g. the EU and the USA) can be large. The international quality standard evaluated by the countries like the EU and the USA before importing the product is very strict and uses modern equipment to test antibiotics, while the equipment and experts of Vietnam are limited and do not meet strict requirements of importing countries. The people and the equipment are always the two main factors, which the people are relative staffs who have limited specialistic knowledge and skill. The equipment as local laboratory of the provincial government is not yet sufficiently equipped.

Some fish farmers use the traditional production way and are concerned with volume

harvested per hectare, rather than the product quality, which is against the SQF 1000 with criteria like the low density stock of fingerling, the average productivity, the industrial feed use and the chemical use out of prohibited antibiotics. However this traditional production way is widely used by small scale fish farmers.

It is not easy for the local authority to supervise and control the antibiotic markets in the whole region. The fish farmers are not so proficient for the use of medicine, and cannot recognize the symptoms which require medication. Veterinarians are seldom consulted. The fish farmers mostly trust the advice of their friends, neighbors, and medical salespeople, and these sources are questionable.

A large number of fish farmers have been using antibiotics in farming, although the local authority pays attention to dissemination activities and has asked the fish farmers to reduce antibiotic use. According to the survey conducted in 2006, 70% of fish farmers had to use antibiotics, to treat fish diseases, 18% to treat polluted water and 12% to increase the health and weight of the fish. This can cause antibiotics to stay in the final fish products, and they

are banned by the EU and the USA.

The home-made feed comprises broken rice, rice bran, trash fish, all mixed together. Its uneaten waste negatively affects the pond water quality and predisposes to animal diseases. Furthermore, the home-made feed, of which the trash fish remains the main protein source, raises more and more constraints due to the trash fish market.

5.4 Aquaculture extension and capacity building

5.4.1 Positive responses

Before the trade dispute, the An Giang DARD played a major role in aquaculture extension, in which the Fingerling Hatchery Centre and the Aquaculture Extension Division were directly responsible. The larger scale fish farmers normally take the aquaculture extension from many different channels, such as the feed enterprises and the state owned EPCs, state organizations and the input service providers. In particular the EPC pays more attention to the fish farmers who are in their own fish club. Unlike the individual fish farmers, the fish farmers under groups/clubs or farming organizations have more opportunities to have good information from different extension channels, such as the DARD, the private hatcheries or the services of feed and chemicals, feed enterprises, state owned and private exporting and processing companies.

There were changes in the extension system after the trade dispute, with the fish farmer not only receiving technical advice from the DARD, the feed companies, the EPCs, but also from the fishery associations (e.g. AFA), and a company established by the farmers (AFA Joint Stock Company - AFASCO). The establishment of fishery associations and the AFA Joint Stock Company play an important role to

link individuals, and also facilitates the farmer communication with stakeholders in the market chain.

In general, there are five main channels consisting of activities of aquaculture extension and capacity building programs that the fish farmer can usually communicate with. These five channels are state organizations, scientists (e.g. institutes or universities), enterprises who supply the inputs and the services, the EPCs, and donors of local projects. Those five partners support activities by directly supplying the extension technique and transfer of modern farming technology to the fish farmer. Of which the four partners which constitute the state organizations, scientists, input enterprises and the EPCs, cooperate to develop live television programs to provide knowledge to the farmer relating to production and market, giving direct answers of what the fish farmer needs to know. This is one of the helpful programs that are the so called “bridge span of farmer”.

Donors of local projects also contribute to the capacity building programs. They link up with state organizations and the EPCs to develop extension activities. Therefore, the donors organized extension programs to farmers. The AusAID’s fund, organizes training courses to build capacity for fish farmers and staffs of relevant organizations. To do this, four other providers, such as the fishery association, the branch of fishery source protection, the fingerling hatchery center and the Pure Pangasius Union¹⁴, are coordinated with the project to set up programs of technical advice and assistance in advanced farming and in technology transfer.

5.4.2 Risks and challenges

Input supply businesses are also involved

in providing technical advice to farmers on the items they sell. However, the quality of that advice may be questionable, because input suppliers are concerned their own benefit rather than the farmers.

The greatest weakness of the extension system is at the commune level¹⁵. The low level of the training facilities and transport services, and the low salaries of extension agents limit the effectiveness. The commune extension workers operate within the commune administration and are not a part of the DARD hierarchy, so they are dependent on the support of the commune officer. The linkages are poor between the commune and the district, and also between the provincial extension centre and the research institutions.

Most of the farms in the MD are private and are run by the owner. About 17%¹⁶ has a technical or an academic background in aquaculture and usual training. Some large scale farmers hire competent technical managers, with more experience, but some have been just graduated from the university, e.g. Can Tho University.

5.5 Market and marketing policy

5.5.1 Positive responses

There are more companies meeting international quality standards. Specifically, there have been big changes in Vietnam's fishery industry from 2005. Presently, there are 152 factories with access to the European market with its strict requirements of quality standards. Also 248 factories have been approved by the USA. Programs are being implemented for investing and improving the food safety requirements and the processing technology, applying quality management systems in use with the GMP¹⁷, the SSOP¹⁸, the HACCP¹⁹ and for the equitization of the state owned

enterprises.

Illustratively, the AGIFISH and the AFIEX are state-owned enterprises that were privatized (converted into joint stock companies) from 2005 onwards. They have contractual arrangements with groups of fish farmers, known as pangasius farming clubs or fishery associations, whereby the company supplies inputs (fingerlings, feed, general aquatic drugs) and technical support to the fish farmers. On the other hand, the farmers supply finished fish to the company under agreed prices and quality standards. The vertically integrated system incorporates strict quality assurance procedures, guided by the HACCP and the ISO²⁰ protocols, and a product that does not satisfy the export standards, goes into the domestic market.

In order to create a stable link between the farming level and the marketing activities enabling a sustainable development, and to secure a benefit for both the fish farmer and the company, the Prime Minister issued the Decision 80/2002/QD-TTG of contract farming. The farm contract has to be signed at the beginning of the crop or at the beginning of a new season. The company is responsible for the capital supply, the technical assistance, the technology transfer, the material input provision (e.g. quality fingerling, feed, aquatic drugs) and the output market of the fish farmer. The farm contracts must cover the required items and have to be prepared on forms issued according to law.

Initially, the provincial government pays attention to a market information system, particularly after the catfish war. The DARD and the Department of Trade (DOT) are actively involved in distributing market information through a monthly newsletter and a Website.

The DOT is also responsible for forecasting the market and for facilitating the local export companies participating in the internal and the external exhibition programs.

The An Giang government has adopted the “four houses/partners” policy as a central feature of its overall development plan. This concept is based on developing synergic linkages between farmers, business enterprises, scientists and the government. The purpose is to integrate these four elements in a way, that will increase the quantity, the quality, the productivity and the profitability of the aquaculture production. As a result, the AFA is a representative organization of the fish farmers who are trying to meet the contract farming agreement with the export and processing enterprises. This policy has contributed to a win-win situation between the fish farmers and the export and processing companies. According to the expert evaluation result, the AFA is a legal organization and presents a common voice to protect benefits of the farmer community and to influence the government’s policy.

To promote the pangasius industry, some provinces have set up some organizations, for example, the VASEP Freshwater Fish Committee (VFFC) in An Giang province. In addition, Pangasius Farming and Export Association (PFEA) was founded in the Can Tho province in 2006. The PFEA is set up by linkage of many partners as shown in figure 14. The members of the APFE are responsible for agreements on marketing contracts, credit, quality fingerling, feed, aquatic drugs and farming technique advice. In general, the AFA, the VFFC, the APPU and the APFE are founded and are an important bridge to bring the fish farmer closer to the world market and to improve product quality and to promote the Vietnamese pangasius trademark. In addition,

the synergic linkage of the community organizations, e.g. the APPU, the PFEA and the AFA are a means to assist fish farmers to become stronger in production, services and marketing, and to work together more effectively. Furthermore, these organizations provide the fish farmers with technical advice, market information, credit through a revolving fund and veterinary supplies.

5.5.2 Risks and challenges

The contract farming agreements have not generally been successful, despite the Government’s policy in favour of such arrangements. In particular, the small scale farmers usually see problems relative to contract farming, due to the fact that the EPCs are not interested in buying directly from small scale farmers with a small amount produced by each farmer. In general, farmers are confused and nervous about forward contracting, due to their limited awareness, while the EPC is opposite. Both parties tend to break the contract if prices move in the wrong direction.

The fish farmer clubs are just informal. Any marketing contract between the club and the EPC is based on the price negotiation at the harvest time and the market situation at that time. Some marketing contracts are broken, because the club membership can not be equated with a certain level of quality and professionalism from the fish farmer. Thus, it is not a substitute for the quality certification in its current form.

The floor price set up can help the fish farmer, but just for a moment. This approach would not be guided by the free market forces, but by government policy. Initially the fish farmers were encouraged to produce more, because their profit was protected. However this might soon result in overproduction, and

we could not know if the procurement would be possible, while the state owned enterprises are privatized. This has put pressure on the floor price policy. In the long run, a floor price could lead to lower prices and less profit for the fish farmer, as the EPC would want to pay prices close to the floor price, seeing no need to pay higher prices, especially if there are supply gluts.

Business development services²¹ have a positive impact on the supply chain, if this action is clearly understood by both enterprises and farmers. However, the experience with the business service development of the stakeholder and of the fish farmer in the Mekong Delta, is limited in most cases (Schütz, 2006)²².

Most fish farmers operate as an independent business, although the farm sizes vary widely. To gain market power, the farmers organize into a farmer association (e.g. Fishery Associations). Because of their many members, the farmer associations or organizations often have an economic size, and control over the supply. This gives them increased bargaining power as suppliers. Their organizational form, however, often slows down their decision making process and operating responsiveness. Not infrequently, the farmer organizations lack adequate professional management and have limited capital, leading to serious operating problems.

The linkage between farmers, business enterprises, scientists and the government (known as the linkage of the four houses), has been chaotic and weak, particularly between the farmer and the business enterprise. The contract farming between the farmer and the business enterprises based on agreement of both sides is normally a simple signed paper,

not approved by the local authority. This means that the legal contract has not been strong enough to tie both sides together toward their financial responsibility.

Some fish farmers prefer traditional individual farming, because they do not know what will happen to them by how their benefits and properties will be protected, if they participate in the farming organizations. In practice, it may be difficult to persuade individual small farmers to sacrifice their independence to farming associations or organizations. It may be hard to ensure that each member can continue to share equally in the decision making process, the farming organization disciplines, and the material benefits.

6. Development strategy

The development strategy is designed to guide the sustainable management of the MD's aquaculture resources for the production of the high quality pangasius and for the generation of the wealth and the employment of the farmers in the MD. This case must be addressed, because fish farmers have gained an increased level of satisfaction by means of fish culture production growth along with corresponding economic gains (Duc, 2009). Fish culture continues to play an increasing important role in farmers' livelihoods and has the potential to develop further in the area. Therefore, the strategy that is derived here is based on the cooperative management framework that will be used to identify and to resolve risks and challenges to the industrial development.

6.1. Building a live fish production region with the best quality

In general, the provincial authorities pay a lot of attention to building live fish production regions of the best quality, but this plan is

sometime revised. The provincial government needs to positively enforce the implementation of that plan, and has to cement the uninterrupted pangasius farming area. Preferable for the region is a good natural condition, close enough to large rivers, because the water usually exchanged in farming plays a key role to maintain and increase the fish quality. In parallel, water sources and environmental issues must usually be concerned and controlled. To enable a positive development, the provincial government should have indispensable activities such as quality fingerling supply assurances, advanced farming technology applications, useful technical support and advice, rural credit and contract farming. Those actions contribute not only to the environmental management, but also to the traceability system development.

6.2. Market development based on controlling shocks and exploring advantages

Controlling shocks and exploring advantages: It was found that the production of pangasius is sensitive to the market price (Binh and Dumont, 2008). If the government is not careful in reorganizing the farming system through the master plan (i.e. developing a farming area to control quantity and quality of pangasius), there can be further threats for farmers. To prevent threats to the farmer, the master plan needs to be properly implemented as soon as possible. In parallel, improvements in linkage between the farmers and the company through contract farming is necessary. One thing is to stabilize the farmer's output. Another is that the fish farmer maintains and improves its competitive ability on the world market. The VASEP must play the main role to gather the EPCs toward a reasonable pricing strategy, this action is to prevent unfair competition between the companies, and to avoid the

trade disputes potential with other countries.

Marketing system reorganization: An efficient marketing system of aquaculture must simultaneously perform a variety of functions. The input supply services, e.g. fingerling, feed, extension, must be regular and always ready for requirements of the aquaculture farming. In the short run, it ensures stable production for farmers. In the long run, it contributes to integrating local markets into national markets, and even into international markets. Activities that should be concerned are as follows

- A market system has to be built to stabilize prices between the seasons, in order to provide an incentive to increased aquaculture production, and to prove increased control of the farmer's activities

- The market information and the available transparency contribute to a correct development strategy. The policy decision makers and implementers have chances to receive recommendations from the researchers and scientists. In general, information on the market, technological knowledge and its transparency, can facilitate the industry to quickly adapt to changes in the domestic and the international markets.

6.3. Strengthening supply chain development

Building commercial linkages between suppliers and fish farmers is regarded as being the most important. The business development services of the suppliers lack marketing issues, for instance, market information, weak bargaining power, unavailability of inputs when needed etc.

- Marketing study tours follow a consignment of produce along the market chain and can be very instructive in this regard. Study tours to observe other marketing success stories can also be very helpful.

- Reorganization of the commercial sector is necessary. Its aim is to guarantee a minimum price to the farmer and to guarantee that the product can be sold, when the agreed quality specifications are met. This transfers part of the price risk from the seller to the buyer, but in return the farmer must guarantee to deliver an agreed quantity, and may proceed all or part of the windfall gains that may arise if the market prices at the time of delivery are above the contracted price.

- Joining the business development services is more comfortable if the small scale fish farmers work together and have collective demands. The supply chain management will be more effective, if the supply and demand of input services are based on marketing contracts.

- Quality assurance systems become increasingly important when individuals or groups are attempting to build a permanent supply chain and forward contractual arrangements.

6.4. Reinforcing the function of the farming organization

The policy framework which is implemented in the MD, puts a very strong emphasis on the role of the linkage of the four houses/partners (farmers, business enterprises, scientists and the government). This is justified on the grounds that commercial linkages are much more easily developed through some form of farmer organization, rather than with large numbers of individual farmers. The efficiency of the linkage of the four houses is not different from the need for a farmer association. However the role of where the four houses begin and end needs to be made clear. The four houses linkage should be created as service organizations which operate for the benefit of

their members.

6.5. Building capacity

While the support of the local authority has access to a range of institutional, governmental, and private service providers who are able to support micro enterprise development, if successful models are to be widely disseminated, the capacity of the province's rural business service providers will need to be further developed. Possible activities include training rural business service providers and a support for community-based service providers.

Raising community awareness of micro enterprise concepts needs to disseminate. In conjunction with activities which target specific sites and farmers, it can also be useful to raise the overall awareness and understanding of micro enterprise development concepts in the wider community. Useful initiatives include the micro enterprise awareness programs in secondary schools and the training of trainers in business development and micro enterprise concepts.

6.6. Commercial fish hatcheries

The fingerling supply of state owned hatcheries has not yet met fish farmer demands, due to the fiscal constraints and the rapid growth of the industry. Existing SME scale hatcheries supply the remainder (e.g. remaining farmers), but there are concerns about the quality of the product. It is therefore recommended that the provincial government should be more concerned about selecting SME scale hatcheries to upgrade their technical and business management skills, also to develop breeds to stable fingerling quality.

6.7. Technological change

Increasingly the farmer operates within the framework of a range of service industries supplying feed, machinery and aquatic drugs.

Alternatively, the output may be held constant and sources directed to the production of more highly value goods. Advances have taken place through the application of scientific discoveries and scientific methods in farm production, such as the pure pangasius farming model or the ecological pangasius farming model. Improvements in quality fingerling and veterinary medicine are indispensable and have provided good low cost supplies and stability.

6.8. Environmental sustainability and interaction

A positive interaction between the pangasius culture and the environment are viable for the pangasius production in particular and the

aquaculture operation in general. If the environmental management however is improper, the aquaculture operations can themselves be detrimental to the environment. The local authority needs a clear development strategy plan for a long term, which appeals to the allies of aquaculturists and environmentalists to build up the plan of the aquatic exploitation and development protection. The natural resource endowment is protected through responsible management systems which will underpin the long term sustainability and productivity of resource-based rural enterprises. In particular, sediment and water discharge, eventually contaminated with pathogens or parasites needs to be minimized. ■

Notes:

1. International Monetary Fund 2006, Vietnam: Statistical Appendix – www.imf.org/external/pubs/ft/scr/2006/cr0652.pdf
2. Technical note, 2006.
3. www.quandoinhandan.org.vn/right.php?id_new=65450
4. Tran, 2004; and Do, 2005.
5. The workshop of “Market Study of Cultured Pangasius from the Mekong Delta” was held in June, 2005 at Can Tho University.
6. <http://www.eurofish.dk/indexSub.php?id=3265>
7. SQF stands for Safe Quality Food. The SQF Program is a fully integrated food safety and quality management protocol designed specifically for the food industry with application at all links in the food supply chain.
 - The SQF 1000 Code is a HACCP based supplier assurance code designed specifically for primary producers.
 - The SQF 2000 Code is a HACCP supplier assurance code which has wide appeal across the food manufacturing and distribution sectors.
8. Pangasius farming area will be 8,600 hectares in 2010, with live fish quantity of 1.25 million tons (VASEP).

9. Pangasius farming area will be 13,000 hectares in 2020, with live fish quantity 1.85 million tons (VASEP).

10. The master plan based on coordination of different departments, such as Department of Agriculture and Rural Development, Department of Planning and Investment, Department of Science and Technology, Department of Trade, Department of Finance, Department of Natural Resources and Environment, People's Committee.

11. The Eurep GAP standards are mandatory standards for any goods going to the main food chains throughout the EU.

12. Best Aquaculture Practices (BAP) Certification schemes allow producers, processors, buyers and importers to respond to consumer pressure to ensure that their farmed seafood comes from environmentally and socially sustainable methods of production, and that processes that maximize food safety are being used. Third party schemes guarantee that strict standards are met and maintained using independent verification.

13. Survey conducted in 2004.

14. A organization under AGIFISH

15. Commune level is a low administration level and managed by district level.

16. Own survey conducted in 2006.

17. GMP refers to the Good Manufacturing Practice Regulations promulgated by the US Food and Drug Administration. These regulations, which have the force of law, require that manufacturers, processors, and packagers of drugs, medical devices, some food, and blood take proactive steps to ensure that their products are safe, pure, and effective. GMP regulations require a quality approach to manufacturing, enabling companies to minimize or eliminate instances of contamination, mixups, and errors.

18. Sanitation Standard Operating Procedure (SSOP) program is the common name give to the procedures in food production plants which are required by the of the . It is considered one of the prerequisite programs of .

19. Hazard Analysis and Critical Control Point (HACCP) is a widely used and internationally recognized science-based control system which identifies and evaluates hazards that might occur in the food production process and puts into place stringent actions to reduce hazards from occurring in food production. This system, when properly applied, focuses on preventive measures rather than end product testing. By strictly monitoring and controlling each step of the process, including microbial, chemical, and physical contaminants, the industry can ensure that its products are as safe as good science and technology allows.

20. ISO (International Standard Organization) is a global network that identifies what International Standards are required by business, government and society, develops them in partnership with the sectors that will put them to use, adopts them by transparent procedures based on national input and delivers them to be implemented worldwide.

21. Business development services refer to non-financial services used by an enterprise to assist its business functioning or to grow, and may be provided in a formal or informal manner. This broad definition covers assistance services in marketing, management, production, information technology, account-

ing and so forth. The business development service concept includes both commercially and thus paid-for services, subsidised assistance delivered free of charge and advice provided informally (Miehlbradt, 2002).

22. <http://www2.gtz.de/dokumente/bib/06-0284.pdf>

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