

SOLUTIONS FOR DEVELOPING AQUACULTURE AND AQUATIC PRODUCTS CONSUMPTION IN COASTAL AREAS OF THANH HOA PROVINCE

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Abstract: *Thanh Hoa province which has a coastline of more than 100 km brings many advantages to the development of aquaculture. In recent years, aquaculture has developed rapidly, quite comprehensively, positively contributing to the growth of the agriculture and socio-economic development of coastal districts. However, in the process of producing and consuming aquatic products in these areas, there are still many difficulties and shortcomings. In this study, the authors focus on SWOT analysis to show the potentials and challenges of aquaculture and consumption of some key aquatic products (*Meretrix lyrata* and *Litopenaeus Vannamei*). From which, the authors propose solutions to develop aquaculture and the consumption of those key aquatic products in the coastal area of Thanh Hoa province.*

Keywords: *Aquatic products, aquaculture, consuming, Meretrix lyrata, Litopenaeus Vannamei, coastal area, Thanh Hoa province.*

1. Introduction

Fishery is an important industry in the economy of Vietnam. The Prime Minister's Decision No. 332/QĐ-TTg dated March 3rd, 2011, mentioned rapid development of aquaculture in industrialization, modernization, efficiency, high competitiveness and sustainable development orientation; to become the main production industry that provides raw materials for export and domestic consumption; at the same time creating more jobs, increasing income for farmers and fishermen, ensuring social security, contributing to poverty reduction and protecting national security. The Decision No. 1445/QĐ-TTg dated August 16th, 2013 of the Prime Minister clearly stated that the fisheries sector will basically be industrialized by 2020, modernized by 2030 and continue developing comprehensively and effectively and becoming a large production industry, with reasonable production structure and forms, with high productivity, quality, efficiency and competitiveness. The estimated total fishery production would be about 7.0 million tons; Seafood export value would be about 11 billion USD.

The coastal area of Thanh Hoa province, with 6 districts, towns and cities, has potentials for developing aquaculture. Thanh Hoa province plans to orient and focus on raising *Meretrix lyrata* and *Litopenaeus Vannamei* (*Meretrix lyrata* takes advantage of the existing coastal areas, and *Litopenaeus Vannamei* is a product with the orientation to expand

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and meet the needs of consumers with higher efficiency). However, in the process of producing and consuming aquatic products in coastal areas, there are still many difficulties and shortcomings such as: Policy access is not timely and sufficient; consumption market is not stable, production resources such as food, seeds, labor are still weak, the environment is still polluted, etc. Therefore, there should be key solutions to develop aquaculture and consume aquatic products in coastal areas of Thanh Hoa province towards the strategic goals.

In this study, we focus on SWOT analysis to see the potentials and challenges in aquaculture and consumption of aquaculture (*Meretrix lyrata* and *Litopenaeus Vannamei*). From which, we propose solutions to develop farming and consumption of some key aquatic products in the coastal area of Thanh Hoa province.

2. Research results and discussion

2.1. Current status of cultivating some aquatic products in Thanh Hoa coastal areas

The aquaculture area is divided by district

Thanh Hoa province has a coastline of more than 100km; it has many advantages in the development of aquaculture. In recent years, aquaculture has developed rapidly, quite comprehensively, positively contributing to the growth of the agriculture and socio-economic development of coastal districts. With 5 districts including Quang Xuong, Nghi Son, Hoang Hoa, Nga Son, Hau Loc and Sam Son city; aquaculture occupies the majority of the aquaculture area of the province and is increasing. Aquaculture area of the coastal areas in 2019 was 9.358 hectares, accounting for 46,5% of the aquaculture area of the province, the growth rate in 2019 compared to 2015 was 24.4%; This proves the potential for aquaculture in the coastal area of Thanh Hoa province has been exploited popularly.

Table 1. Aquaculture area in coastal areas of Thanh Hoa province, 2015 - 2019

Item	Area (ha)					Comparison (%)
	2015	2016	2017	2018	2019	2019/2015
The whole province	16.156	16.340	17.058	18.504	20.098	124.4
Coastal area	7.904	8.026	8.086	8.695	9.358	118.4
Sam Son	58	213	171	158	139	239.7
Hoang Hoa	2.150	2.183	2.384	2.423	2.692	125.2
Nghi Son	1.008	1.022	849	855	1.067	105.9
Quang Xuong	1.450	1.319	1.265	1.377	1.271	87.7
Hau Loc	1.720	1.769	1.768	1.920	2.138	124.3
Nga Son	1.518	1.520	1.649	1.962	2.051	135.1

Source: Thanh Hoa Statistical Office, 2019

The increase of aquaculture areas in coastal areas shows the right direction under the guiding presented in the Fishery Law of Vietnam, contributing to the strategy of restructuring the fisheries sector of Thanh Hoa province. However, due to regional characteristics, the aquaculture area is unevenly distributed among districts and the development rate is also different. In 2019, Hoang Hoa district had the largest aquaculture area of 2.692 hectares

(accounting for 28,8%) while Hau Loc district reaches 2.138 hectares. The changes in the rate of aquaculture development in different districts are due to the planning of agricultural land for projects; the transition, merge and division of administrative boundaries.

Area distributed by species

Coastal aquaculture in Thanh Hoa province is characterized by development of diverse species adapted to the environment. Tiger shrimp as largest farming area and was accounted for 44% of aquaculture area in 2019. The area of tiger shrimp farming is decreasing slightly because many households have invested in infrastructure and technology to switch to intensive farming with the new type of shrimp farming. Therefore, the area of *Litopenaeus Vannamei* has increased significantly, although only 2.9%. *Litopenaeus Vannamei* develops in line with the general trend of Vietnam's shrimp farming industry to meet the tastes of consumers and is the orientation in the development strategy of the aquaculture industry in Thanh Hoa province [3]. That is also very effective, creating jobs for many laborers in the region, but without professional qualifications, it will lead to high risks of unsustainability such as its impact on the farming environment around the region. With the advantage of coastal area, being able to exploit for breeding mollusks, especially *Meretrix lyrata* which is a typical breed of 16% in the war zone. At present, *Meretrix lyrata* concentrates mainly in Hau Loc and Nga Son districts.

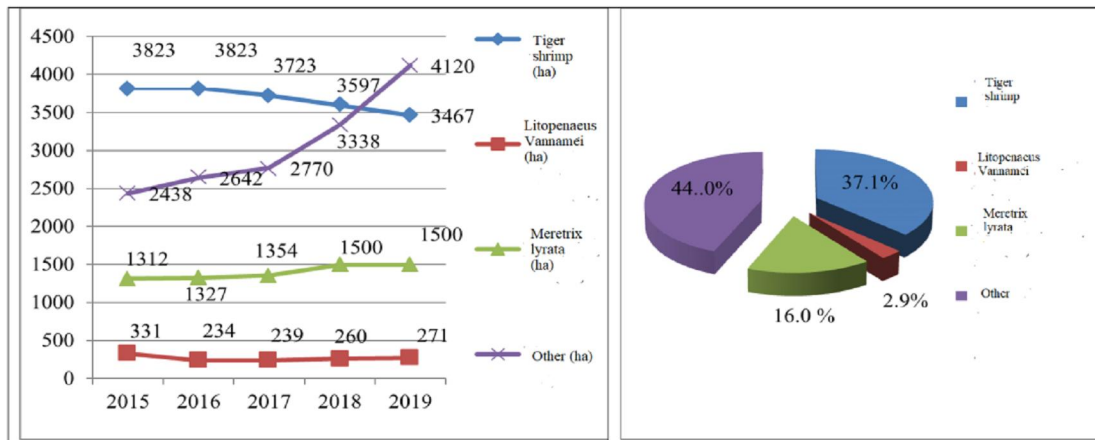


Chart 1. Area of aquaculture in coastal areas by species, 2015-2019

Chart 2. Aquaculture area structure in coastal areas by species in 2019

Source: Summary of reports on fisheries sector in coastal districts 2015-2019

Productivity and volume of aquaculture in coastal areas

Meretrix lyrata has high productivity (10 tons/ ha/ year) compared to other aquatic species (tiger shrimp is only 0.27 tons/ ha/ year). The remarkable yield of *Litopenaeus Vannamei* averaged 11.54 tons/ ha/ crop), because this farm was usually raised 2 crops/ year, compared with tiger shrimp raised 1 crop/ year. Along with the increase in the aquaculture area, the aquaculture production in the coastal area is quite high, accounting for 55.8% of the total aquaculture production of the province, of which the *Meretrix lyrata* production is the highest with 15.000 tons. Thus, the farming of *Meretrix lyrata* and *Litopenaeus Vannamei* are only in the coastal area.

2.2. Strengths, weaknesses, opportunities and challenges for the development of aquaculture and consumption of some key aquatic products in coastal areas of Thanh Hoa province

2.2.1. Strengths (S)

Coastal zone has potential of climatic conditions and terrain for the development of aquaculture *Meretrix lyrata*, with 102 km long coastline, stretching along the coast is the river mouth and distributed all districts and cities in the coastal area. The coastal sandy land has an average elevation of 3-6 m; there are large tidal zones that are favorable for *Meretrix lyrata*. This is also a condition for forming the water environment for *Litopenaeus Vannamei*.

More than 20 years experience of raising *Meretrix lyrata* (from 1996 the first clam was kept in Nghi Son, then replicated in the following years, to other coastal districts), and 18 years experience of raising *Litopenaeus Vannamei* (starting from 2002).

Road and waterway transportation in coastal areas is convenient for trade, tourism development, creating opportunities for the consumption of aquatic products (Tourism in Sam Son, Hai Tien, Hai Hoa, Quang Loi, etc.). In 2019 - 2020, Sam Son city, and Nghi Son town has created more advantages in developing the aquatic products consumption market in general and for *Meretrix lyrata* and *Litopenaeus Vannamei* in particular.

Meretrix lyrata and *Litopenaeus Vannamei* is exported products, which have majority market in China and the EU. In the future, the market share and product consumption in other countries is also gradually expanding.

2.2.2. Weaknesses (W)

The productivity of *Meretrix lyrata* and *Litopenaeus Vannamei* are low compared to other regions, such as Nam Dinh reached 17 tons/ ha/ year (Coastal area of Thanh Hoa province reached 10 tons/ ha/ year). The quality of *Meretrix lyrata* is still low, the consistency and uniformity of the clam is not high. *Litopenaeus Vannamei* productivity in the coastal area of Thanh Hoa province reached about 11 tons/ ha/ crop, meanwhile the Southern Provinces achieved higher productivity.

The level of access to policies related to farming aquatic products is limited, only through the passive direction of agricultural extension workers and local authorities. The farmers' have not yet grasped the opportunity to access.

Aquatic product processing facilities are weak: *Meretrix lyrata* processing factories are not yet available in the area. Some shrimp processing and exporting factories have weak infrastructure, few functions of collecting, preliminarily processing and preserving fresh products for export.

The association is simple, not effective yet. Vertical and horizontal linking is still simple; it has not been paid much attention. This is a difficulty in farming and consumption, especially the weakness in chain linkage.

The consumer market is not stable, the export market share is not large; almost products from *Meretrix lyrata* of Thanh Hoa are only for domestic consumption or small export to the Chinese market. The main reason is the change in color of *Meretrix lyrata* and

poor quality. This is due to the high density of *Meretrix lyrata* and water sources are polluted in many places. The product's origin has not been traced. Modern channels of consumption are still limited and difficult.

Farming conditions: Inadequate infrastructure, seed supply is difficult, quality labor is low, lack of capital is the difficulties in raising *Meretrix lyrata* and shrimp.

2.2.3. *Opportunities (O)*

Convenient international exchange is an opportunity to develop markets for products, especially when Vietnam joins world organizations. Especially in the context of the development orientation of Thanh Hoa province is to become one of the four northern economic poles along with Hanoi, Quang Ninh and Hai Phong.

The area of tiger shrimp farming to *Litopenaeus Vannamei* farming is being encouraged and selected. The planned farming area in 2025 will reach 710 hectares (also possibly expanding to 450 hectares) [3].

Government attention: The orientation of restructuring the fisheries and aquaculture sector has also been interested in such as supporting policies on bidding for *Meretrix lyrata* farm, loan policy for changing shrimp farming areas, guidance on technical support, fishery infrastructure has been upgraded and newly built by the province and localities.

Consumers tend to use natural products, replacing other food, so they tend to use *Meretrix lyrata* and *Vannamei* Shrimp.

Export potential: *Meretrix lyrata* and *Litopenaeus Vannamei* are two products with relatively large export volume. It is forecasted that by 2025, *Litopenaeus Vannamei* of Vietnam will be exported to US with the value of \$6541 million (76% of shrimp export value) [5].

2.2.4. *Threats(T)*

There are many seafood products competing with *Meretrix lyrata* and *Litopenaeus Vannamei* in the coastal area of Thanh Hoa province (There are 28 coastal provinces in the whole country; many coastal areas thrive to raise *Meretrix lyrata* and *Litopenaeus Vannamei*).

Pollution from aquaculture, seafood processing, and polluted water cause risks in farming. Climate change also affects aquaculture. The waste treatment in the *Litopenaeus Vannamei* farming areas still has many facilities that do not arrange settling ponds or do not ensure the capacity to store and filter wastewater. This causes the risk of environmental pollution, causes epidemics to spread and breaks out in concentrated aquaculture areas, etc.

Climate change has a negative impact on the agricultural sector. *Meretrix lyrata* and *Litopenaeus Vannamei* have a quite strong impact; (1) Effect of temperature: An increasing in temperature could reduce fisheries production in ponds and lakes; (2) The effects of droughts, floods, and thunderstorms, decreasing salinity in ponds suddenly beyond the tolerance level, causing shock, death or slow growth; (3) Impacts of sea level rise on the fisheries sector [4].

From there, the SWOT model is built in Table 2.

Table 2. SWOT model

<p>SWOT</p>	<p>Opportunities (O) Convenient international exchange. The ability to expand the farming area of Litopenaeus Vannamei is still large. The attention of the State. Needs of consumers increasing. Litopenaeus Vannamei is Having the most potential to export.</p>	<p>Threats(T) There are many competitive products. Pollution from aquaculture wastewater, seafood processing. Climate Change</p>
<p>Strengths (S) There is potential in natural conditions. Experienced in farming. Road and waterway traffic is convenient. Export product</p>	<p>Strengths - Opportunities (SO) Expanding export markets. Expanding the farming area of Litopenaeus Vannamei like implementing the planning of the farming area. Creating conditions to register the origin of products; issuing Viet GAP certificate to Viet GAP farm.</p>	<p>Strengths - Threats (ST) Searching for new consumer markets. Increasing application of technical progress. Taking solutions to reduce environmental pollution.</p>
<p>Weaknesses (W) The productivity of Meretrix lyrata and Vannamei Shrimp is low compared to other regions. Missing policies; Policy access remains difficult. Aquatic product processing establishments are weak. The association is simple, not effective yet. The consumer market is not stable; the share of export is not broad. The conditions for farming: Infrastructure is weak; Limited quality seed supply, control of feed for Litopenaeus Vannamei is difficult; The quality of labor has not met the requirements of farming techniques, the capacity to access the market is limited; Lack of funds.</p>	<p>Weaknesses - Opportunities (WO) Complete policy; Improve access to policies for Meretrix lyrata and Litopenaeus Vannamei farming in terms of capital. Encouraging investment in developing and processing aquaculture. Strengthening links in farming and consumption of Litopenaeus Vannamei, Meretrix lyrata, especially chain linkage. Promoting investment and awareness of high quality seed. Increasing investment in regional infrastructure for Meretrix lyrata and Litopenaeus Vannamei; support for production loans, control seed and feed supply. Train to improve the quality of labor to meet farming techniques and improve the capacity to access consumer markets.</p>	<p>Weaknesses - Threats (WT) Exploiting market in the province. Orienting farmers to aware and adapt to climate change. Controlling imported seed.</p>

3. Some solutions to develop farming and consumption of some key aquatic products in coastal areas of Thanh Hoa province

First, Complete and improve the accessibility of policies, plan to support farming and consumption of some key aquatic products: It is necessary to have policies which support production, capital, seeds, supplies, advanced scientific and technological approach, technical training, infrastructure and farming areas; linking production and consumption; attracting businesses to participate in the production chain; Research and implement insurance policies in fisheries, especially insurance policy for key seafood products; Continue to improve the policy access, planning aquaculture, vertical management functions.

Second, strengthen chain linkage, reorganize production by value chain from raw material production to processing and consumption; Building typical chain models for zones: Reorganizing production in the value chain from raw material production to consumption processing, creating cohesion, profit and risk sharing between raw material producers and seafood processing enterprises; Strengthening the linkage of 4 partners: government, scientists, businesses and famers; ensuring the rights farmers; create conditions for farmers to feel secure in production; Pilot construction link farming and consumption of Meretrix lyrata and vannamei shrimpat one of the areas, then continues to replicate typical model other districts in coastal areas; Developing models of cooperative groups, fisheries cooperatives and community management practices .

Third, increase production conditions to improve efficiency for aquaculture and consumption: (1) The farmers need to perform construction and infrastructure sufficient to handle pollution of aquaculturewater (for vannamei, they need to invest in building settling ponds to treat the water environment); Focus on investment and planning infrastructure for farming areas from tiger shrimp to Litopenaeus Vannamei; (2) Strengthen technical training program for aquaculture households, need to pay attention to popularization market news, market approach for households; (3) Encourage banks and credit institutions to participate in the strategic linkage between banks - enterprises - households; (4) Seed in the province did not meet, need to actively seed source; (5) For feed supply: select suppliers, respect feed ingredients carefully and consult technical experts.

Fourth, promote the application of technical advances in aquaculture to improve productivity and enhance climate change adaptive capacity: Develop VietGAP farming model to meet product quality trends and reduce disease risks.

Fifth, stabilize and develop the aquaculture consumption market: Building a joint venture mechanism, linkage between aquaculture farmers as raw material areas with businesses; Planning to develop a system of processing factories and commercial cold storage to increase efficiency and regulate a stable source of raw materials; Developing modern distribution channels in seafood consumption to encourage farmers to consume through contracts with restaurants, processing enterprises, etc.

Sixth, minimize water pollution in aquaculture: For farmers, perfecting the infrastructure system for farming, environmental treatment when epidemic outbreaks occur. For processing facilities, focus on investment and operation of centralized collection systems, rational

classification of industrial and domestic solid waste; manage, store and transfer hazardous solid waste in accordance with regulations. For State, propagate and raise community awareness about the responsibility of environmental protection, strengthen inspection and control. For communities in farming areas, carry out monitoring communities, concentrated farming areas should have community management solutions in the management of the water environment.

4. Conclusion

Exploiting the advantages of coastal areas in order to develop suitable types of aquatic products is the restructuring strategy of Thanh Hoa province in the direction of increasing added value and promoting development of seafood consumption in coastal areas by sustainable direction. Solutions to develop aquaculture and consuming aquatic products for coastal areas in Thanh Hoa province will be the basis to ensure stable output, also support original traceability, improve product reputation, and increase competitiveness to bring higher economic efficiency to aquatic products in general and *Litopenaeus Vannamei* and *Meretrix lyrata* in particular for the coastal areas of Thanh Hoa province.

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