

Aquaculture in Vietnam

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Abstract

Aquaculture in Vietnam has gained momentum and now produces 370,000 tons of various aquatic commodities. Aquaculture includes shrimp culture in the Mekong Delta; fish culture in cages in rivers, reservoirs, and coastal waters; fish culture in ponds and lakes; mollusk culture in the northern provinces, culture of soft-shell turtle in some provinces, culture of the seaweed *Gracilaria*. In north and central Vietnam, aquaculture has increased the protein supply, the foreign exchange earnings, employment opportunities, and the living conditions of the people. Vietnam aims to develop aquaculture to produce more than 600,000 tons of aquatic products by the year 2000.

Introduction

Vietnam has about 1.4 million hectares of water bodies suitable for aquaculture. Only about one-third of the surface area is used for aquaculture, now producing about 370,000 tons of fishes, crustaceans, mollusks, seaweeds, and turtles. Expansion has been rapid in brackishwater and freshwater areas. The contribution of aquaculture to the total annual fisheries production has increased from 307,000 tons in 1990 to 373,000 tons in 1993. With active measures and technical improvements, Vietnam aims at producing more than 600,000 tons of cultured aquatic products by the year 2000.

Farmers have paid special attention to shrimps, crabs, fishes and other species of high economic value (Table 1). In recent years, the traditional extensive culture method has been improved or upgraded to semi-intensive systems with the use of hatchery-produced larvae and artificial feeds.

Aquaculture has improved the protein supply, foreign exchange and export earnings, employment opportunities, and the living standards of the people in Vietnam.

Table 1. The aquatic species cultured in the northern, central and southern provinces of Vietnam.

Species	North	Central	South
Crustaceans			
<i>Penaeus monodon</i>	+	++	++
<i>Penaeus merguensis</i>	+	+	++
<i>Penaeus orientalis</i>	+		
<i>Metapenaeus ensis</i>	++	+	++
<i>Panulirus ornatus</i>	+	+	+
<i>Scylla serrata</i>	+	++	++
<i>Macrobrachium rosenbergii</i>	+		++
Freshwater fishes			
<i>Cyprinus carpio</i>	++	+	
<i>Ctenopharyngodon idella</i>	++	+	
<i>Aristichthys nobilis</i>	++	+	
<i>Hypophthalmichthys molitrix</i>	++	+	
<i>Cirrhina molitorella</i>	++	+	
<i>Puntius gonionotus</i>		++	
<i>Labeo rohita</i>	+		
<i>Ophicephalus spp.</i>			++
<i>Oxyeleotris marmoratus</i>			+
Marine and brackishwater fishes			
<i>Epinephelus ornatus</i>	+		
<i>Lates calcarifer</i>	+	+	+
<i>Seriola spp.</i>	+		
<i>Siganus sp.</i>			+
Red seaweeds			
<i>Gracilaria spp.</i>	++	++	
<i>Eucheuma sp.</i>		++	
Mollusks			
<i>Pinctada margaritifera</i>	+	+	+
<i>Pteria martensii</i>	+	+	+
<i>Chlamys nobilis</i>	+	++	+
<i>Arca granosa</i>	+	+	+
<i>Arca subcrenata</i>	+	+	+
<i>Meretrix spp.</i>	+	+	+
<i>Ostrea rivularis</i>	+	+	+
Turtle			
<i>Trionyx sinensis</i>	++	+	

++ Aquaculture well developed

+ Aquaculture limited

Most of the data in this paper were obtained from the reports my colleagues (Nguyen The Ann, Bui Dinh Chung, Pham Thuoc, Vo Van Trac) and I presented at the National Workshop on Environment and Aquaculture Development in Haiphong, Vietnam in May 1994. A report about the Haiphong workshop also appears in the NACA Newsletter 11(2): 1-3, 11 (Apr-Jun 1994).

Shrimp Culture

Shrimp culture has developed rapidly and widely during the past decade. The area under marine shrimp culture was 30% greater in 1993 than in 1990. In 1993, about 200,000 hectares were used for shrimp culture and production was 40,000 tons. The Mekong Delta was the main area for shrimp culture with 170,000 hectares producing 33,000 tons.

The method of shrimp culture is mainly traditional extensive with average yields not more than 500 kg/ha-yr. The semi-intensive method is used in tiger shrimp culture in the Mekong Delta where ponds are 0.01-2 hectares in size. The average yield is 1 ton/ha-yr, but some ponds can obtain 1.5-2 tons/ha-yr. The area under semi-intensive culture is only 3,000 hectares.

There are now 238 shrimp hatcheries in Vietnam producing annually about 300 million postlarvae of different species (Table 2). This quantity met only about 10% of the demand of the farmers engaged in shrimp culture. Most of the hatcheries are in central Vietnam, from Qui Nhon to Phan Thiet. The postlarvae have to be transported to the Mekong Delta and some of the northern provinces of Vietnam.

Table 2. Development of the shrimp hatchery industry in Vietnam. Data from the Fisheries Bulletin, Ministry of Fisheries, Hanoi.

Year	Number of hatcheries	Postlarvae produced (million)
1986	16	3.3
1988	20	30
1989	45	200
1990	215	250
1991	215	300
1993	238	>300

Mudcrab Culture

Culture of the mudcrab *Scylla serrata* is being developed in the northern provinces from Quang Ninh to Thanh Hoa as well as in the Mekong Delta plain. Crabs are grown mostly under semi-intensive conditions in small family-scale ponds. In bigger ponds more than 10 hectares, crabs are cultured with shrimps and the seaweed *Gracilaria*. Juvenile mudcrabs (body weight 50-70 grams) are collected mainly from the wild. Extensive crab culture can produce

100-200 kg/ha-yr and the semi-intensive method can yield 1,000 kg/ha-yr. Cultured crabs are sold mostly in Chinese markets at prices of VND 70,000-120,000/kg (about US\$7-10/kg in 1993).

Freshwater Prawn Culture

Culture of the giant freshwater prawn *Macrobrachium rosenbergii*, either in monoculture or polyculture with rice, is also being developed in about 14,000 hectares of the Mekong Delta. In 1988, the production of freshwater prawn was about 5,000 tons. Two hatcheries produced postlarvae of the giant freshwater prawn.

Fish Culture

Fish culture is being developed in ponds and lakes throughout the country. There are 78,000 hectares of freshwater bodies producing annually about 220,000 tons, at yields of 1.7-4 tons/ha-yr. The cultured freshwater species are the common carp, grass carp, bighead carp, and the Indian major carps (Table 1). There are 375 hatcheries supplying the farmers annually more than 5 billion juveniles of different freshwater fishes. In the northern provinces, hatcheries provide enough juveniles and no more are collected from the wild.

Fish culture in cages is being promoted widely in rivers, reservoirs, and coastal waters in Vietnam. The production from fish cages in the northern provinces was more than 6,000 tons in 1993. Each cage of 18-24 m³ produced an average of 600-800 kg; after deducting all expenses, the net income was 50-60% of the total production cost.

Culture of the marble goby *Oxyeleotris marmoratus* in cages is being developed in rivers and reservoirs. The stocking density is 50-60 fish per cage and the yield is 400-600 kg from each cage after 8-10 months.

The marine fishes now cultured in cages are the grouper *Epinephelus ornatus*, the sea bass *Lates calcarifer*, yellowtail *Seriola* sp., and the white-spotted rabbitfish *Siganus* sp. The major difficulty in marine fish culture is the lack of juveniles for grow-out.

Seaweed Culture

Due to increased market demand and improved culture technology, a rapid leap has been made in seaweed culture. The species being cultured in Vietnam are *Gracilaria asiata*, *G. blodgettii*, and *G. tenuistipitata*. Culture is mainly by extensive and improved extensive methods. The intensive method has been used recently but in small scale only. The improved extensive method yields 100-200 kg/ha-yr of dried seaweed. The semi-intensive ponds of 0.1-5 hectares yield 2-4 tons/ha-yr (dry).

Gracilaria production has gradually increased to about 2,000 tons dry weight in 1993. Depending on the market, the production has potential to increase in the coming years. *Gracilaria* is now used mainly for agar production for the domestic market; export markets are yet lacking.

Other seaweeds like *Eucheuma* and *Kappaphycus* have been cultured on experimental scale since 1992. Commercial culture of these species in Vietnam is expected in the near future.

Mollusk Culture

Aquaculture of several species of mollusks is being developed in Vietnam (Table 1). Culture of freshwater and marine pearl oysters is now in the initial stage of development. Among the northern provinces, Quang Ninh has great potential for expanded aquaculture of clams, cockles and scallops in the tidal zones.

Turtle Culture

The soft-shell turtle *Trionyx sinensis* is being cultured in some northern provinces. In Hai Hung, there are about 600-700 households involved in turtle culture. The other provinces with 300-400 households culturing the soft-shell turtle are Ha Noi, Ha Bac, Nam Ha, Ninh Binh and Ha Tay. The turtles are cultured in small ponds managed by individual families. The major consumers of soft-shell turtles are the Chinese. The selling price has increased to VND 280,000-350,000/kg in 1992-93.

Upgrading Aquaculture Technology

The main directions of aquaculture development in the coming years are the following:

- Develop and apply suitable culture technologies.
- Apply appropriate culture technologies to aquatic species of high economic value to obtain more production.
- Conduct research to perfect and apply appropriate culture systems that ensure ecosystem balance and limit damage to the environment.
- Refine (hatchery) technology for artificial seed production to meet the requirement of fish and shrimp farmers.
- Develop health management measures (prophylaxis, prevention and treatment of diseases) for cultured species, and promote locally available drugs of plant origin rather than imported chemical drugs.
- Expand the supply systems of aquaculture services and goods such as feeds, seed, and drugs.
- Develop post-harvest processing to add value to aquaculture products.
- Conduct research on genetic selection techniques for important cultured species, and on the conservation of genetic diversity particularly among indigenous aquatic species.

The topography, climate, and ecosystems in Vietnam differ much between the southern and northern provinces. Therefore, the appropriate aquaculture technologies and species must be determined and applied accordingly.

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Editors' Addendum

An informative account of the brackishwater integrated farming systems in Vietnam is given by de la Cruz (1995). Several papers in recent issues of *Naga*, the ICLARM Quarterly describe freshwater and brackishwater farming systems in Vietnam (Le 1992, Le 1994, Lin and Lee 1992, Nguyen 1993, Nguyen and Tran 1993, Nguyen et al. 1993, Le 1994, Truong et al. 1994).

A report about the Haiphong workshop also appears in the NACA Newsletter 11(2): 1-3, 11 (Apr-Jun 1994). In Vietnam, technologies have been developed for breeding and grow-out, including feeds and feeding, of major species. Lacking or inadequate are technologies for genetic selection, disease prevention, diagnosis, and treatment, and Seafarming. Most aquaculture areas were developed without adequate planning and without provision against ecological damage. Policies for aquaculture development lack an environmental approach. Activities in other sectors (agriculture, industries, energy generation, etc.) have caused harm to the water environment.

The Haiphong workshop ended with recommendations for the rational utilization of resources for sustainable aquaculture in Vietnam, one set each addressed to the farmers, to R&D institutions, to government, and to agencies for international cooperation.

For farmers:

- Protect the water environment. Wastewater should be properly treated before discharge into common waterways.
- Interact closely with fishery extension workers.
- Invest in improved extensive, semi-intensive, or intensive culture methods, preferably for high-value species.
- Develop a proper plan for any aquaculture project based on a thorough site survey. Management plans and actual operations must include protection of mangrove forests and watersheds.
- Use drugs and chemicals in aquaculture properly.

For R and D institutions:

- Strengthen the basic survey work to collect and process data needed to assess the status and potential of water bodies as basis for development planning.
- Conduct research on the interactions among resources, culture systems, and the environment in order to achieve sustainability.
- Conduct studies on the conservation and rehabilitation of genetic diversity, including rare or threatened species.
- Develop a national research program to reduce the risk of pollution in water bodies and to manage and treat wastes before these are discharged into water bodies.

- Improve existing technologies and develop new and progressive ones, particularly in:
 - * breeding marine fishes and other high-value species
 - * intensive culture with emphasis on health management
 - * development of vaccines and drugs
 - * feed formulation and production
 - * genetic selection for high yields

For government:

- Take rapid action to provide clear and precise guidelines for the application of the Law on Protection of the Environment, Ordinance on Protection and Development of Fishery Resources, and the Veterinary Ordinance. Provide details and specific rules and regulations on the following:
 - * management, protection, and development of aquatic genetic materials
 - * management and sustainable use of water bodies
 - * epidemiology and veterinary monitoring of aquatic products
 - * registry and management of seed production and culture practices
- Refine the policies that promote sustainable aquaculture.
- Increase support for R and D institutions.
- Support research that helps in formulating an updated multi-sectoral plan, which will include key areas and ecosystems, and which will become the basis for guidelines to investors and farmers regarding environmentally sustainable culture systems.
- Mobilize investments in upgrading of the agro-fishery infrastructure and technical services system for the industry.
- Establish an effective network of fish inspection and fishery environment control.
- Improve the fishery extension system and develop a program geared to closer community participation.
- Support the establishment of protected areas for the conservation of biodiversity.

For agencies of international cooperation:

- Assist Vietnam in formulating a national program for the development of sustainable aquaculture.
- Assist in identifying and establishing protected areas for biodiversity conservation.
- Coordinate with scientists and research centers in developing appropriate, environment-friendly technologies in aquaculture.
- Assist in training specialists in genetic selection, environmental management, protection of resources, and in planning and policy formulation for sustainable aquaculture.
- Exchange information and experience in the organization and operation of fishery extension, fishery inspection, management and control of water resources, and fish health services system.

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