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Overview of Penaeid Culture in the Americas

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Abstract The paper discusses the reasons behind the farming success of Ecuador, as well as the limitations associated with farming throughout the rest of the Americas. Emphasis is given to specific farming practices, management techniques, and physical design characteristics. Through improved techniques the farmer is approaching the point where he can reliably manage his crop size and harvest time as dictated by market trends and postlarval supply.

Until recently, pond production has been characterized by relatively small-scale operations often experimental in origin. Due to the farming success in one country, production output has risen from 4,800 tons in 1978 to 23,390 tons in 1983. As evidenced by this dramatic rise in production, Ecuador is in a period of expansion and increasing technical awareness, the combined results of which have led it to become the production leader in pond-grown shrimp.

The economic pull towards Ecuador is now slowly giving way to shrimp development in other parts of the Americas. Owing to the technical gains brought about by government programs, universities and private industries, shrimp farming has become a potential activity in many areas previously thought inadequate. Production methods have progressed from the traditional extensive method to sophisticated closed system raceways. All but the latter method are exemplified by the techniques used throughout Ecuador.

Presently, Ecuador has in production 50,000 ha of ponds. Of these, 30,000 ha are farmed using the extensive method characterized by low cost and low output. The successful approach referred to as the semi-extensive method occupies approximately 15,000 ha. This style of farming, while requiring increased cost, leads to a proportionately higher production output. The third approach is the semi-intensive method under which an estimated 5,000 ha are in production. Increasingly higher production rates are being achieved through improvements in physical pond design, pond maintenance and preparation, feeding and fertilization regimes, technical management, and control.

Introduction

There are four major shrimp farming areas in the Americas: 1) North America — U.S.A. (Hawaii, Texas, North and South Carolina) and Mexico; 2) Caribbean — Antigua, Bahamas, Cuba, Dominica, Dominican Republic, Grenada, Guadalupe, Jamaica, Martinique, Puerto Rico and U.S. Virgin Islands; 3) Central America — Belize, Costa Rica, Guatemala, Honduras and Panama; and 4) South America — Brazil, Ecuador and Peru.

Shrimp culture in Latin America

Latin America (Central and South America) has recently become the world leader in shrimp farming. Among the several countries presently involved, Ecuador and Panama have developed the techniques now used in extensive marine shrimp culture. The viability of natural resources all year round, low wages, inexpensive coastal areas suited for farming, cheap fuel, adequate climate, and plenty of wild postlarvae from the estuaries have all contributed to the expansion

Table 1. Status of shrimp and prawn production in North America.

Country	Species	Facilities	Status	Prospects
U.S.A.				
Hawaii	Marine shrimp (*Penaeus vannamei*)	Farms (200 ha) Raceways	In production	Limited due to cost of land and available area High technology
	Intensive marine shrimp	Hatcheries		
	Freshwater shrimp (*Macrobrachium*)			
Texas	Marine shrimp (*P. vannamei*)	Farms (100-200 ha)	In production	Limited due to cost of land and labor Limited season
Florida and the Carolinas	Marine shrimp Freshwater shrimp (*Macrobrachium*)	Small area	In production	Very limited
Mexico	*P. vannamei*	Very small area	Projected and under construction	Great potential Need to change laws

of farming in these countries. What were accidental observations early in the sixties have grown to a multi-million dollar industry.

The introduction of technology and management has improved the yield, reliability and profitability of the farms into sophisticated operations which involve careful planning

Table 2. Status of shrimp and prawn production in Central America.

Country	Species	Facilities	Status	Prospects
Belize		Very small	Projected or under construction	With potential
Costa Rica	Marine shrimp	Farms (130 ha)	Not very good, closed in 1982	Uncertain Some interest due to government stability
	Freshwater shrimp (*Macrobrachium*)	Farms (80 ha)	Original investor gone	
Guatemala	Marine shrimp (*P. vannamei*)	Farms' (260 ha)	In production	Small potential
	Freshwater shrimp	Farms (40 ha) Hatchery		
Honduras	Marine shrimp	Farm (100 ha)	In production Hatchery closed in 1981	
	Freshwater shrimp	Farms (50 ha)		
Panama	Marine shrimp (*P. vannamei* and *P. stylirostris*)	Farms (2,000-3,000 ha) 2 hatcheries	In production since 1978	Suitable areas limited to 5,000 ha Limited supply of postlarvae

Table 3. Status of shrimp and prawn production in the Caribbean Islands.

Country	Species	Facilities	Status	Prospects
Antigua		Farm (about 10 ha)	Under construction	Uncertain, dependent on imported postlarvae
Bahamas	Marine shrimp		Limited production (one crop harvested)	Imported postlarvae
	Freshwater shrimp			Limitation due to winter influence
Cuba	*P. schmitti*	Farm (8-20 ha)	Top priority, Ministry of Fisheries	Uncertain
Dominica	Freshwater shrimp	Farm (small) for demonstration		Limited
Dominican Republic	Marine shrimp	Farm (50 ha)	Under construction	No marine shrimp hatcheries
	Freshwater shrimp	3 hatcheries	In production	
Grenada	Freshwater shrimp	For demonstration	Under construction	Limited
Guadalupe	Freshwater shrimp	Ponds (11 ha) since 1978	More ponds projected	
	Marine shrimp	3 hatcheries (with very small production)		
Jamaica	Freshwater shrimp	Farm (10 ha) Hatchery	In production	Small
Martinique	Freshwater shrimp	Farm (100 ha) Hatchery	In production since 1976	For local consumption
Puerto Rico	Freshwater shrimp	Farm (10-50 ha)	One project, another closed	
U.S. Virgin islands	Marine shrimp (*P. vannamei*)	Hatchery	Fry production for Bahamas	

Table 4. Status of shrimp and prawn production in South America.

Country	Species	Facilities	Status	Prospects
Brazil	*P. japonicus* *P. vannamei* *P. schmitti*	Farms (1,000-2,500 ha) 10-20 companies	In production Problems with fry supply, salinity and rain	Large potential Difficulties: Access, financing, fish meal packing plants and government are near South
Ecuador				
Machala Bahia Guayas Esmeraldas	*P. vannamei* and other marine shrimp	Very large involvement Farms (=50,000 ha) 4 hatcheries, several in planning stage	In production since 1970 20-40% yearly increase in production since 1978 Exported 50,000 lb tails in 1983	Areas available for expansion 70,000 ha Limited availability of postlarvae led to decreased production in 1984
Peru				
Northern Peru	*P. vannamei*	Farms (2,000-3,000 ha) Limited to border with Ecuador	Production from wild fry	Potential 6,000 ha No hatcheries

Table 5. Factors affecting the growth of the shrimp industry in the Americas.

Area	Favorable factors	Constraints
North America		
U.S.A.	1. U.S. market 2. Technology and technicians available 3. Excellent support services — roads, transportation, telephone, electricity, equipment, parts, services	1. Short growing season 2. High cost of land, labor and energy 3. Limited areas available 4. Hurricane threats 5. Cultured species are exotic, hence the need for hatcheries
Mexico	1. Market proximity 2. Extensive areas available with year-round growing season 3. Availability of native species for culture 4. Relatively stable government	1. Laws limit export of shrimp to cooperatives 2. Difficulties in obtaining resident visa 3. Economic crisis which devaluates foreign investments by paying export dollars in pesos 4. Complicated country to deal with
Central America	1. Availability of wild fry 2. Cheap land 3. Cheap labor 4. Closer than South America to U.S.A. and Europe 5. Existing shrimp trawling industry and processing plants, with knowhow in packing and marketing	1. Political instability 2. Past failures make financing more difficult 3. Limited areas 4. Limited skill and knowhow 5. Limited support services 6. Some countries are complicated to work in
Caribbean	1. Sometimes with local shrimp market (tourists) 2. Proximity to U.S. market 3. Air transportation available 4. Nice area to live in	1. Exotic species 2. Hurricane-prone areas 3. Limited available land 4. No processing plants 5. Limited facilities 6. Unstable governments in some cases
South America		
Brazil	1. Large country with all types of land and climates 2. Existing processing plants and post-harvest facilities 3. Cheap electric energy 4. Interest in promoting exports 5. Shrimp farming already initiated 6. Pleasant country to live in	1. Native species not suitable for farming 2. Suitable areas far from main cities 3. Unstable climate 4. Limited support in Northern area 5. Lack of knowhow 6. No fish meal
Ecuador	1. Successful experience which facilitates promotion 2. Some wild postlarvae available 3. Existing processing plants 4. Some experienced people 5. Year-round good weather with no hurricane threat 6. Good clay soil 7. Limited rain	1. Inadequate postlarvae cannot meet demand 2. Available land limited and costly (US$1,000-2,000/ha) 3. Overcharging of shrimp farmers 4. Too much government control 5. Poorly trained manpower out of school and universities 6. Difficult areas to live in

and execution of the several phases of production. From simple farming the process has grown to include hatcheries, nurseries, grow-out, feeding, fertilizing, harvesting, processing and exporting. The coordination of all phases has to be accomplished for the successful production of shrimp.

The outstanding quality of farmed shrimp is slowly being recognized in the most demanding markets. It is principally achieved due to freshness in processing, considerably less handling compared to common boat operations, and constant year-round supply. Farming is becoming a serious threat to boat operators who will be forced to reduce the number of boats to improve their catch per boat, and to stay in step with the rising cost of energy and the lowering of prices for shrimp.

The involvement of different countries can be individually observed in Tables 1-4 which summarize some of the information.

Ecuador

Ecuador has three major production areas:

1. Machala (south) — Where shrimp farming originated; has maintained its tradition of extensive, low-yield production.

2. Bahia (north in Manabi Province) — Second area where shrimp farming developed very rapidly with the introduction of some technology and farm rationalization.

3. Guayas (central near Guayaquil) — Largest of all three areas and also has largest potential. Mixed results when technology was copied from other two areas. Better results from large farms where advanced technology in design, construction and management has been applied with very good results.

The reasons for the successful farming experience in Ecuador may be traced to ecology, agriculture, politics and economics. Ecology has been the most important factor, providing postlarvae of the species *Penaeus vannamei* and *P. stylirostris* year-round, salinity between 6 and 33 ppt, temperature between 23 and 32°C, and sufficient land with high clay content and pH of 8.

Ecuador is a country of agricultural workers forced out of agriculture due to land reform implementation and political prices for its products. It was easy to convert the equipment and workers from agriculture to a similar activity — aquaculture — with limited skill required.

Politically, poor government management of the oil resources produced inflation and an economic crisis which practically stopped commerce, housing construction and industry, on top of the semi-paralyzed agricultural activities. People who wanted to work and produce legally had no other choice but to start a shrimp farm taking advantage of a non-labor intensive operation, with some financing available.

Last but not the least factor was profitability due to good shrimp prices and good revenues in dollars which was the kind of money everybody wanted.

Future of shrimp in the Americas

There will be individual problems in each country (Table 5) but, on the whole, shrimp culture will grow very fast due to the following factors:

1. Development of hatcheries and technology
2. Strong dollar-oriented activity and belief in its profitability
3. Non-labor intensive
4. Techniques which can be easily copied
5. Availability of coastal land in areas not suitable for agriculture.