

The Present Status, Competitive Position, and Long-Term Potential of the Penaeid Shrimp Mariculture Industry in Belize, Central America

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ABSTRACT

At the request of the Government of Belize (GOB), Ministry of Economic Development, an RDA International, Inc. (RDA) field team conducted a survey and assessment of the shrimp mariculture operations in Belize, Central America in May 1989 to:

1. Identify the needs, problems, and constraints of the industry;
2. Determine and compare Belize's competitive position in the U.S. and CARICOM markets relative to other regional shrimp exporting countries; and
3. Estimate the long-term potential of the industry.

The reasons why the shrimp mariculture industry has not developed as initially expected, the current needs of the industry, and the economics of shrimp production in Belize are discussed. The country's competitive production advantages and disadvantages are pointed out. An estimation is given as to the long-term (10-year) potential of the shrimp industry in Belize. Recommendations are made as to how the GOB can assist and promote the country's shrimp mariculture industry.

INTRODUCTION

RDA International, Inc., (RDA) is a private, technical assistance, and consulting company specializing in fisheries and aquaculture development projects. In May, RDA was contracted by the United States Agency for International Development (USAID) at the request of the Government of Belize (GOB) to:

1. Identify the problems and constraints of the shrimp mariculture industry in Belize;
2. Estimate Belize's competitive position in the U.S. and major CARICOM markets; and
3. Estimate the long-range potential of the industry in Belize.

This paper is a condensed version of the more detailed RDA final report submitted to the GOB, and USAID.

The RDA team was comprised of a biologist, an economist, and a shrimp market specialist. The team visited all seven shrimp farms in the country, which

were in various stages of construction and/or operation. In addition, they met with government representatives from the Ministry of Economic Development, Department of Fisheries (Aquaculture Unit), and the Belize Export Investment and Promotion Unit, and visited several fisheries cooperatives.

A number of studies on the prospects for shrimp mariculture in Belize have been conducted over the past several years. The conclusions reached and opinions provided regarding the feasibility of shrimp mariculture in Belize have varied widely. Little scientific evidence was available to the RDA team to support or refute the conclusions of these earlier studies, so RDA's findings and conclusions are based primarily on direct, on-site observations, conversations with present shrimp farm managers, and reasonable assumptions made by the RDA team.

While better overall conditions exist elsewhere in Central America, climatic conditions are satisfactory and suitable sites are available for shrimp culture in Belize. Why then do existing shrimp culture operations in Belize appear to be less successful economically than those in neighboring countries?

First, existing operations in Belize have had management problems. Problems noted included poor site selection, poor design and construction of ponds and facilities, and less than optimum species selection. These problems are not exclusive to Belize, but they are more apparent in a country where there are only a few independent commercial operations.

Second, the relative lack of supporting infrastructure (roads, power, cold storage facilities) in Belize directly impacts the producer, and increases unit costs disproportionately for the small producer. The capital costs for establishing a shrimp farm in Belize have been estimated by entrepreneurs at US\$4,000 to US\$8,000 per acre, a range which is double the cost for similar enterprises in other Central American countries and the U.S.

THE HISTORY AND PRESENT STATUS OF SHRIMP CULTURE IN BELIZE

Attempts in Belize to rear shrimp in ponds began in 1983 and have continued with limited success to the present time. Some of the advantages given for establishing shrimp operations in Belize include:

1. Inexpensive, flat coastal land;
2. Political stability;
3. Limited bureaucracy;
4. Active government support and attractive currency regulations; and
5. Proximity to major markets in the USA and CARICOM countries.

Despite these important advantages, the industry has shown only modest

growth and production has remained well below expectations. Foreign investors already benefit from corporate tax holidays (5 – 10 years) and repatriation of profits from invested capital. To improve their situation further, these investors have requested other privileges and incentives, including a recently granted abolishment of the 5% export tax on shrimp, tax-free diesel fuel, and an industrial rate for electricity, in addition to requests for new (access) roads, electricity connections, and other amenities.

Some of the disadvantages to shrimp mariculture in Belize include:

1. No local postlarvae supply;
2. No local feed production; and
3. Absence of local venture capital.

Given these positive and negative factors, the question remains whether shrimp mariculturists, with appropriate management, can operate in a manner which is profitable to both themselves and the country as a whole.

Characteristics of Production in Belize

The seven shrimp farms are located along the coast between Ladyville, near Belize City, and Independence, 90 miles to the south. There is a great difference in stocking rates employed at the farms. The majority of growers stock their ponds at densities ranging from 20,000 to 80,000 shrimp per acre, although one farm claims to stock up to 600,000 shrimp per acre. These farms are employing or plan to employ standard shrimp culture methods, which are:

1. *Extensive culture*—low stocking density: 12,000 – 15,000 shrimp per acre.
2. *Semi-intensive culture*—higher stocking density: 20,000 – 75,000 shrimp per acre.
3. *Intensive culture*— high stocking density: usually above 80,000 shrimp per acre.

At the time of the study, all but one farm has been principally financed by expatriate (North American) investors. Except for a limited amount of processing by the fisheries cooperatives, the farms have been largely self-sufficient, relying primarily on imported inputs. However, most of the farms have experienced significant delays in obtaining these essential inputs due to the long shipping periods from the U.S.

Overall, production results have been disappointing. Production information is sketchy, at best. Producers are still in an experimental stage, and accurate records were not available regarding actual input, production, and cost levels. In

general, production ranges from 200 – 1400 lb/acre/year. Approximately 540 acres of ponds are currently available for stocking but only 25% are stocked. An estimated 25,000 pounds of cultured shrimp tails were exported during 1988 with some farms exporting a small part of their production. Production may have actually reached 80,000 pounds in 1988. In 1987, production was estimated at 50,000 pounds. The increase of 30,000 pounds for 1988 is primarily from added acreage and not from improved per acre production.

Species that have been cultured in Belize are *Penaeus vannamei*, *P. stylirostris*, and *P. schmitti*. Most farmers are inclined to use *P. vannamei* because of better production results even though postlarvae (PL) have to be flown in from other countries. Results using *P. stylirostris* in Belize were not favorable despite the good results obtained by farmers in Panama and Colombia. The local species, *P. schmitti*, has the negative characteristic of rarely growing to sizes exceeding 36 – 40 count per pound (headless).

There is one stand-alone hatchery in the country which was not in operation during the study. One large integrated farm also has hatchery facilities. These were not operational however due to a lack of adequate broodstock. This farm has imported shrimp nauplii for growing to PL stage at their own facilities. Other Belizean farms have either purchased PLs from this farm or directly from Panamanian or U.S. sources.

Since mariculture produces a similar product to capture fisheries, it is useful to review both sectors to gain a perspective on the processing and marketing aspects of the mariculture industry. Most shrimp produced in Belize at the present is wild caught. However, wild shrimp only comprises a small proportion of total capture fisheries. The estimated yearly production of shrimp caught by artisanal and industrial vessel activity is estimated at 365,000 pounds (165 MT). Shrimp is often regarded as an attractive by-catch in the lobster fishery. Species landed are mainly *P. schmitti* and *P. notalis*. The first is the dominant species, and a major part of the production consists of 21 – 25 and 25 – 30 count sizes (headless, shell-on). It is believed that the resource cannot support any substantial increase in fishing effort. Fishermen generally dehead shrimp on their boats, and then deliver the product to one of the cooperatives for subsequent processing and marketing.

Groups Involved in Shrimp Mariculture

At the present time, most managers of shrimp mariculture operations in Belize are expatriates. However, a few Belizeans, educated abroad, are beginning to make valuable contributions. Many of the laborers and technicians working with the farms are nationals of other Central American countries, partly due to the number of immigrants residing in the growing areas. Managers have indicated that they would fill all possible labor and technician positions with Belizeans so long as individuals who are available conform to working

requirements on the farm. Given the relative fragility of a shrimp crop, managers depend on the consistency of their work force.

The Belizean fisheries cooperatives, which process wild-caught shrimp for their members, have also processed farm-raised shrimp. The available processing capacity for seafood in Belize is almost exclusively in the hands of the cooperatives. From the 1987 export figures, it is clear that lobster is by far their major source of income and consequently, priority in processing technology and infrastructure is geared towards lobster. In 1987, lobster exports totaled 470,000 pounds valued at some US\$5.8 million, while shrimp totaled 218,800 pounds valued at US\$1.1 million. Of the total shrimp exports, farmed shrimp constituted only 9%.

Cooperatives are processing most of the cultured shrimp. During the April 1987-March 1988 season they exported 23,713 pounds of farmed shrimp out of total shrimp exports of 284,250 pounds. The Placencia fisheries cooperative presently is best located to do processing for many of the shrimp farms and has assisted with processing shrimp for some of the farms. The cooperative will need to increase its ice production capacity and its capability to process relatively large volumes in short time periods to meet present and future needs. Recent records of the Belizean Fishermen Cooperative Association indicated that Northern Coop took care of all the farmed shrimp processing in 1988.

Cooperatives are very keen to process and export more cultured shrimp despite the relatively small sizes. However, they are reluctant to make any investment solely for shrimp as they first want to make sure that an increase in shrimp production is forthcoming. The increase would have to come from culture operations, given the limits to further exploiting wild stocks. The same reason was given for the limited interest in producing value-added shrimp (based) products. Without sufficient advance warning of the dates of harvest and approximate volume of shrimp to be processed, cooperatives are presently unable to meet increased demand.

Constraints and Needs of the Shrimp Mariculture Industry in Belize

The initial investment cost of developing shrimp mariculture in Belize appears to have been, and continues to be, the single most significant impediment to rapid development of the industry in Belize. The capital costs for establishing a shrimp farm in Belize have been estimated by entrepreneurs at US\$4,000 to US\$8,000 per acre — double the cost for similar enterprises in other Central American countries and the U.S.

The reason for such elevated capital costs can be attributed to the isolation of production sites from existing infrastructure within Belize, and the need (real or perceived) for importing a majority of materials and equipment. Entrepreneurs in most cases are generating their own power because they are beyond the reach of the national electrical distribution system. They are also

obliged to keep adequate supplies of spare parts on site because of long delays experienced in the import of replacements. Finally, most shrimp farms in Belize have short- to medium-term plans to establish relatively large-scale operations in order to realize economies of scale for operations such as on-site hatcheries, power generation and pumping stations, and freezing and/or processing, since such services are not otherwise available.

The following obstacles have been encountered by entrepreneurs in Belize:

General

1. Funding was mentioned by almost all producers as a major constraint to aquacultural efforts in the country.
2. Initially there were few to no service industries serving the fledgling shrimp mariculture industry, and each farm necessarily had to take on all areas of farm construction individually.

Construction

3. In many cases, pond construction costs have been higher than projected due to the necessity of removing silt or sand and replacement with clay. Additionally, contractors have not always met pond construction schedules and quality requirements.
4. Weather is critical to pond and water delivery system construction, and efforts must be suspended during the rainy season — usually the months of July through January or February.
5. Belize lies within the hurricane belt, so provisions must be made when constructing ponds to withstand periodically severe weather conditions, or to repair installations after the fact.

Operations

6. Low nutrient levels in Belizean waters require high levels of fertilizer in ponds to encourage planktonic and other macroorganisms' growth which is necessary for cover and supplemental food sources for the pond-reared shrimp.
7. Extremes in salinity during the rainy season inhibit growth rates and every effort should be made during site selection to insure that adequate sea water is available to maintain optimum salinity levels.
8. There is a serious lack of cultured shrimp processing equipment within the country.
9. Many ponds in Belize have had stocking delayed or suspended while waiting for delivery of seed. Probably the highest priority need for successful farming of shrimp is a completely dependable supply of healthy seed stock.

**ESTIMATE OF LONG-TERM (10 YEARS) POTENTIAL
OF THE SHRIMP INDUSTRY IN BELIZE**

This paper has addressed many of the obstacles which have slowed the establishment of a shrimp mariculture industry in Belize. Many deficiencies are being remedied by the mariculture entrepreneurs themselves, while others are being alleviated by the overall development of the country. GOB undoubtedly can play an increasingly important role in guiding mariculture development to its optimum level.

The next five years may be critical for the shrimp mariculture industry in Belize. The key will be to promote an integrated development of all components, to realize efficient and uniform production of shrimp, and develop an industry which can not only survive but excel in an increasingly competitive market.

The Aquaculture Unit of the Ministry of Fisheries can play a prominent role in promoting the integrated development of the various components of the industry, acting as an informational source both for technical questions and simply facilitating communication between all groups working with the shrimp product. In particular, support of a hatchery to ensure production of quality seed as needed will reduce a major constraint to regular production, particularly for smaller farms which cannot afford to have their own hatchery. While PL prices are not a major cost factor, Belize must not risk the possibility of PLs not being available on international markets, no matter the price.

Aquaculture entrepreneurs in the country may succeed in putting 700 acres of ponds into production in the next ten years. These would produce an annual yield of 630 short tons of shrimp tails. The cooperatives appear to have significant potential to utilize their organization to increase their processing capacities to meet this projected increase in annual production. Eventually, GOB may wish to promote the production of a local feed to meet the need for 2,600 short tons annually which would be required for the projected yield.

**RECOMMENDATIONS FOR GOVERNMENTAL ASSISTANCE
TO PROMOTE SHRIMP MARICULTURE**

The main recommendations made by RDA International to the Government of Belize included:

1. The Government of Belize should continue its incentive programs and concessions to existing farms. The five- to ten-year time-frame for exemptions may be extended for these first pioneers if the government receives sufficient evidence that entrepreneurs are truly pursuing staged development as a result of financial constraints.

The government may wish to acknowledge that entrepreneurs presently

in-country have invested significant time and effort in establishing an industry. Entry of new entrepreneurs may be premature pending demonstration that cultured shrimp production can be economically viable within the country.

2. The existing (and under construction) farms should be allowed continued "freedom to develop" or "laissez-faire."
3. The Government fisheries unit should be provided with additional staff and support to allow at least the present aquacultural staff to become active in the field as true extension personnel. These professionals can be very helpful in transferring technology to the shrimp farmers and in gathering much needed information regarding the true status of shrimp pond culture in Belize. In the long run, these government extension agents can assist local farmers to enter the aquaculture industry, once shrimp culture is established in Belize.
4. Hatchery and processing operations should be regarded as separate, support services by agricultural funding agencies. For instance, a hatchery system might easily run as a successful business based solely on PL production for export regardless of whether or not any grow out farm is successful in Belize. Similarly, a local feed mill might be assisted in meeting feed needs for shrimp farms, locally and for export.
5. An effort should be made to strengthen a loosely organized aquaculture association. This can be done by formalizing a group which includes the owners/managers of the seven existing (and under construction) farms and professionals from the academic community, government officials interested in promoting fisheries and economic development, service providers, product users, and laypersons interested in farming aquatic species.
6. If credit financing does become available for small satellite farms, ensure that each does not attempt to duplicate all the necessities of a large farm
7. Farmers should be encouraged to make use of the processing facilities and marketing services offered by the cooperatives. The cooperatives have played a significant role in the development of the capture fisheries product and they have much to contribute to the cultured shrimp product with their organization and infrastructure. By relying on an established institution within the country, shrimp farmers may remove one element of risk in their operations. To date, farmers do not appear to have fully investigated the potential of working with the cooperatives.

Farms which do not have sufficient production for economies of scale in processing, (*i.e.*, those with a production of less than 200,000 pounds), can particularly benefit by taking their production to established processing plants. Cooperative processing facilities are generally of high

quality, staff is well trained, and product movement is quick and efficient.

Cooperatives may also be a centralized source of substantial supplies of ice. In cases where distance is excessive, farms should consider acquiring small freezer installations. Eventually cooperatives may be able to assist in the construction of a processing plant which would be specifically located to cater to the shrimp culture industry.

The cooperatives can also market the products in their own name or in the name of the farmer. Generally the farmer will be able to obtain a better price (with no additional marketing cost) from the cooperatives as they market the smaller farmed sizes with the larger wild shrimp resulting in an overall better price level. Production from the farms is often in too small quantities to be marketed effectively.