

Shrimp Farming: A Business Today; Profits and Problems

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I was asked to speak to you today about the truth of penaeid salt-water shrimp farming, its successes and its failures. Actually, I should say failures first, because in this industry there have been many more failures than successes! Today in several parts of the world there are some very profitable ventures taking place, and I have been told that my operation is one of those. However, I haven't been able to retire yet.

In Ecuador, shrimp farming is a reality with more than 40,000 hectares in production or under construction. But most of these farms are unsuccessful, and have no idea why or what it takes to make their farms profitable. There are a few good Ecuadorian farms that are overwhelmingly successful. They are getting rich just by following a few simple rules. They have learned not to repeat their errors a second time, and by using a little common sense, teamed with skilled management, they can program the farms' needs over a year's time and complete the schedule as closely as possible to their projected goals.

Mariculture farming is a very profitable business with an even brighter future, being shaped by the goals that we are attaining today. The use of unskilled labor that can be easily trained and the type of land needed for a shrimp farm makes it an ideally suited business for a non-industrialized, tropical country located by the sea.

Today, my company is helping to design, plan and construct farms in the Caribbean area. I am sure they will be more successful than I was in the beginning. These projects will be using the most modern methods on their farms and in their hatcheries. The great advantage of building a mariculture operation today are the errors I committed 8 years ago. From these experiences, the new farms will not suffer the low harvests, the loss of time in construction through errors in planning and the mistakes of general operation that were so costly in the past.

One of the most common errors in the history of shrimp farming was not knowing how many live animals, of the right species, you had in a pond. This in turn caused over- or under-feeding, causing a very disturbing and inconsistent line above and below the projected earnings and cash flows. Today, we have found how to predict and project the future harvest, its cash needs and cash flows, and the number of animals that will be harvested within 5% at any given time during the operation. There is enough historical background now in shrimp farming to predict and control the future with very certain and positive results.

Today in Ecuador with the average farmer, a harvest takes place 160 days after seeding, and the number of shrimp harvested in pounds per acre is about 500 lb per year with 1.5 crops per year per acre. Our farms, in exactly the

same area, are consistently producing in excess of 3,600 lb per acre per year, with 3 crops or more per year per acre and an average food conversion of 1.23 lb per pound of produced shrimp. Our expectations in the next 24 months are to at least double this quantity of shrimp being produced. The reason for my optimism is that in many other areas of the world, there are working farms producing on a very small scale, four times the quantities I am today producing in Ecuador.

Let me backtrack a minute and talk about the beginning of shrimp farming 400 years ago at the time of the Incas. During the high spring tides, the normally dry salt-water lagoons would fill with the rushing sea carrying with it many small sea creatures, including shrimp. The Incas would rush in, close off the mouth of the estuary, and wait 3 or 4 months for the lagoon to dry out. Then they would harvest the shrimp and give them to the Inca or his royal family. The major differences between what the Inca was doing then and what we are doing today, is in the elimination of predators (fish, crabs, birds, people), knowing the species and number of shrimp in the pond, feeding the shrimp the exact quantity needed for fast growth, and harvesting at the time when that growth ceases to be profitable. In most Ecuadorian farms the original system the Inca used has changed very little and for that reason, the size, time and net return for them is very unprofitable.

A mariculture operation can be very successful with a little care and observation of the needs of a shrimp in its growth cycle. We try to duplicate and improve the conditions that the shrimp could have on the ocean floor. By improving the pond bottom to resemble as closely as possible the natural habitat, we create a comfortable, stress-free home for the animals. We try to maintain a biologically clean environment, free of ammonia or any other harmful chemicals. We feed the shrimp food that will make them grow, and change that food depending upon their size, age and species. We eliminate the waste the shrimp produce, and we have the ability to change their breathing environment so their growth will not be restricted by lack of oxygen. Also, it is very important, as I stated before, to completely eliminate the predators, the fish, birds, crabs, and most of all, the people. Of all the predators, we, the human race, are the most difficult to keep away from the shrimp during their growth stage. These are some of the differences that make the bottom line, making profit against investment a very good proposition.

Another major problem in the past has been to have enough seed stock (small shrimp or larval stage shrimp) on hand in order to consistently produce on a continuing basis. It does no good to your cash flow to have dry ponds waiting the arrival of seed. The availability of small shrimp to maintain the farms in a continuous operation is an indispensable ingredient. In some areas of the world, enough wild seed is taken from nearby estuaries to satisfy a farm's needs, maintaining two harvests a year. The problem is, two harvests a year are not a good enough return for most investors; the very large profits come when the shrimp are harvested from three to four times a year. The only way to accomplish this is by having a maturation laboratory producing sufficient seed stock when you need them.

Maturation means being able to produce small shrimp through the sexual

development of large, adult shrimp in the laboratory. These animals are bred every 2 to 3 weeks, producing 100,000 to 200,000 eggs from each impregnated female. These same animals can be used for the next several months before changing to a new brood stock. Several species of shrimp may be used though at this moment none are found in the Caribbean area. Desirable species come from Japan, the Philippines and the Eastern Pacific Ocean area. Today there is no problem with brood stock transported from different areas being held in small ponds until needed in the laboratory. The shrimp can be held in captivity up to the fifth or sixth generation and still be used to reproduce baby shrimp.

The maturation laboratory can be a very sophisticated operation, employing several techniques to change and optimize the natural reproduction cycle of the shrimp. Eye ablation is one of the processes used for both male and female shrimp. Ablation causes the shrimp's normal body functions and growth patterns to change into a reproductive cycle. It is believed that the eye contains a hormone inhibitor that represses sexual maturation. Generally, within 10 days after one eye is pinched or removed, the female is ready to spawn, or ready to receive the sperm. In some species, the female carries the sperm with her for a period of days, and in others, only for several hours. This difference in species is referred to as the closed and open pelicum type. Our laboratory can produce young shrimp from both types. In some species of shrimp, the males may be sexually inactive making it sometimes necessary to artificially inseminate the female with the manually ejaculated sperm. The sperm packet is attached to the ripe female and approximately 2 hours later the eggs are expelled from her body and fertilized by the sperm.

In our laboratory we begin with the brood stock, or adult animals. These are helped to become more sexually active by ablation, diet and optimum living conditions. When the female is ripe, she is either naturally or artificially inseminated by the male shrimp. After she has expelled her eggs, laboratory technicians collect the eggs from the hatching tanks, check for their fertility, and then carefully incubate them for 10 to 20 hours, when the eggs hatch to the napalii stage. The hatched napalii are fed through three successive stages for the next 15 days and then readied to be shipped from the laboratory to the farm and its juvenile ponds.

At this point, we enter the phase that is called farming. The animals arriving from the laboratory are 15 days old. Upon arrival the water carrying the animals is checked for temperature, salinity, pH and the animals themselves are checked for their heartiness. If any one of these items do not correspond to the water conditions in the juvenile ponds, the animals are slowly acclimated to the water in the pond where they will spend the next 45 days. After the initial acclimation period, the animals are put into pre-growth juvenile ponds until they reach a weight of 0.7 gram, in a density of 2.5 million shrimp per hectacre.

Acclimation is one of the key words and processes in shrimp farming. Stressing the shrimp with poor acclimation can cause high mortality, slow growth, or even stop them from growing completely, staying the same small

size until harvest. The proof in the quality of acclimation is found by going one step further in the process of transferring the shrimp. You must be sure of the number of animals that survive the transfer from the laboratory. This is done by putting a fine mesh screen beneath the animals when freed into the water of the juvenile ponds. The ones that don't swim away and are caught on the screen are considered your transfer mortality. This same process is repeated at the end of 45 days upon transferring to the adult ponds. Knowing the mortality of your transferred animals reduces the chance of over or under feeding, thus keeping to your projected goals and success.

Once transferred to the adult ponds, the shrimp take 85 days to grow 18 to 19 grams. The densities in these grow-out ponds range from 75,000 to 125,000 animals/hectare, the quantity depending on the time of year and the species involved. The average mortality is 10% between juvenile and harvest size animals. As we learn more about feeding, water quality and management, we are increasing the size of the shrimp, decreasing the food consumed and producing more animals per hectare in a shorter period of time. Presently, our company is harvesting ponds up to 3.4 times a year with a mean average of three times annually, with a food conversion of 1.23 lb of feed per pound of harvested shrimp.

As I have stated before, there are many important factors leading to the success of a mariculture operation. You need a consistent supply of seed stock year round. In the farms, predator control, water quality, feeding and acclimation of animals, at transfer, all team to make a profitable venture. But there is one other indispensable factor, actually the most important in the process of salt water shrimp farming, and that is people. Having responsible, thinking, hard-working and *experienced* personnel can make the difference between a huge success or a depressing, financial failure.

Not a week goes by that I don't have a new, aspiring scientist in my office, with new ideas and ways to revolutionize the business. The first thing I ask is for their experience in raising salt water, penaeid shrimp. A project that costs millions of dollars must have experienced, production-wise people, and there aren't many available today in this world. I'd say probably not more than 10 altogether with the knowledge to produce on a high-level production basis. There are some production people with experience with macrobrachium or catfish, and some that have worked on small, experimental farms. But truly experienced, dedicated people are few.

The farmers that invest in a mariculture operation without the aid of a working and producing hatchery, a scientifically set-up farm and experienced, hard-working personnel, are the ones that end up as unhappy investors. Probably 80 to 90% of all shrimp farmers in business today are doomed to failure because they are caught up in the romance of the business, not realizing its complexity and the work involved. The competitive nature of shrimp prices, the cost of fuel and labor and the high cost in the infrastructure and water exchange, make shrimp farming a very competitive business. So start out on the right foot beginning with successful people who have the experience. With careful planning and follow-through, the profits can be up to

60% of the gross sales. The market options are unlimited, with consumption in the U.S. and Japan in excess of 900 million lb a year and increasing. The sea catch is decreasing, so the farm future is very bright.

The big difference between our operation and others is that we don't have a huge corporation to fall back on. The business cannot be a scientific endeavor but a truly profitable operation, from the first day of stocking to the final day of harvesting. Our costs must be kept at a minimum and our profits at a maximum. The mystery of shrimp farming is out of the hands of the scientists, and is now in the hands of producers. Today, the profit motive is the reason for the existence of the mariculture business.