



# SEAFDEC TRAINING DEPARTMENT

SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER

TD/RES/33

May 1993

THE DEVELOPMENT AND ASSOCIATED PROBLEMS  
OF  
INTENSIVE SHRIMP CULTURE IN THAILAND

by  
Akihiro KIKUCHI

Research Paper No. 33  
May 1993



THE DEVELOPMENT AND ASSOCIATED PROBLEMS  
OF  
INTENSIVE SHRIMP CULTURE IN THAILAND

by  
Akihiro KIKUCHI

Training Department  
Southeast Asian Fisheries Development Center

## CONTENTS

	Page
Introduction .....	1
Shrimp culture in a suburb of Bangkok .....	4
Shrimp culture in southern Thailand .....	6
Shrimp farming cooperatives .....	9
Summary .....	12

THE DEVELOPMENT AND ASSOCIATED PROBLEMS  
OF  
INTENSIVE SHRIMP CULTURE IN THAILAND

**Introduction**

The main areas of the world producing cultured shrimp are located in Asia and in several countries in South America. The dominant species of cultured shrimp in Southeast Asia is the black tiger shrimp (*P. monodon*). The culturing technique was first established in Taiwan and its success encouraged other Asian countries to initiate their own modern shrimp culture.

Shrimp culture usually falls into three categories by type of operation.

1) Extensive culture: Rearing is only with natural shrimp larvae which live in brackish water. The shrimp feed on the nutritious food matter in the water. No artificial foodstuffs are introduced. The size and shape of the pond is not specified. The supply and drainage of water is by the natural power of tidal flow.

2) Semi-intensive culture: Fundamentally the ponds are similar to 1), however, artificially grown shrimp larvae are released into the pond and artificial feeding is carried out.

3) Intensive culture: The size of the pond is generally smaller than those of 1) and 2) with a few exceptions in the case of large-scale projects implemented by big companies in the south. All shrimp larvae are supplied from a hatchery. High protein artificial bait is given as feed several times a day. Chemical materials and medicines are used to improve pond conditions and avoid shrimp disease. Aeration devices are installed in the ponds and water quality management is practiced.



In Thailand, the extensive shrimp culture system has existed for a long time. However, intensive culture which has become more dominant nowadays only began in 1986. Despite the high cost of setting-up intensive ponds, the number of operating units has increased rapidly since 1987. (Table 1)

Table 1. Number of farms, area under culture (only having product), production, value and yield per rai of shrimp farm, 1972-1989.

Year	No. Farms	Area (rai)	Production (ton)	Value (million baht)	Yield/rai/year (kilograms)
1972	1,154	56,602	991.00	20.50	17.50
1973	1,462	71,678	1,635.00	35.30	19.40
1974	1,518	75,576	1,775.00	43.20	23.49
1975	1,568	80,422	2,538.29	81.80	31.56
1976	1,544	76,850	2,533.33	79.45	32.96
1977	1,437	77,567	1,589.54	56.09	20.49
1978	3,045	151,055	6,394.83	349.16	42.33
1979	3,378	154,222	7,064.07	460.59	45.80
1980	3,572	162,727	8,063.05	458.91	49.55
1981	3,657	171,619	10,727.87	657.26	62.51
1982	3,943	192,453	10,090.77	765.68	52.43
1983	4,327	222,107	11,549.85	950.37	52.00
1984	4,519	229,949	13,006.75	1,024.01	56.56
1985	4,939	254,805	15,840.56	1,348.42	62.17
1986	5,534	283,548	17,885.83	1,737.58	63.08
1987	5,899	279,812	23,566.47	3,449.32	84.22
1988	10,246	342,364	55,632.84	7,900.55	162.50
1989	12,545	444,785	93,494.50	11,072.19	210.20

Department of Fisheries, Thailand.

The success of established techniques of intensive shrimp culture in Taiwan encouraged Thai businessmen to enter this field, so that after 1987, many intensive shrimp ponds were developed by Thais but unfortunately often without the necessary technical background in shrimp culture. This development was encouraged by the Department of Fisheries of the Thai government which was eager to promote intensive shrimp culture and make frozen shrimp a major export commodity. (Table 2)

Table 2. Number of farms, area of shrimp culture by province, 1984-1989.

Province	1984		1985		1986		1987		1988		1989	
	No. Farms	Area ( Rai)	No. Farms	Area ( Rai)	No. Farms	Area ( Rai)	No. Farms	Area ( Rai)	No. Farms	Area ( Rai)	No. Farms	Area ( Rai)
Total	4,519	229,949	4,939	254,805	5,534	283,548	7,264	325,929	11,838	417,071	14,235	474,551
Trat	12	753	17	1,627	81	5,975	153	7,864	177	8,748	291	13,536
Chanthaburi	161	6,759	163	6,884	263	12,029	315	13,360	1,516	38,487	1,959	65,343
Rayong	1	16	4	47	17	278	88	3,958	127	6,326	127	6,326
Chon Buri	69	3,288	71	3,330	80	3,687	80	3,687	121	4,378	120	4,156
Chachoengsao	138	7,233	150	7,946	231	10,326	293	11,162	306	10,939	313	10,059
Samut Prakan	1,017	44,022	1,017	44,022	1,019	43,741	1,206	45,344	1,535	48,072	1,535	48,072
Bangkok	553	22,835	571	23,019	586	23,168	811	27,328	975	27,225	983	27,439
Samut Sakhon	1,020	46,153	1,016	45,971	1,033	47,646	1,173	50,481	2,101	71,062	2,295	76,622
Samut Songkhram	523	34,150	567	37,285	591	39,114	890	45,827	1,271	53,975	1,244	53,419
Ratchaburi	-	-	-	-	-	-	3	14	3	24	-	-
Phetchaburi	131	11,056	140	12,082	147	12,689	280	16,945	622	28,324	620	28,134
Prachuab Khiri Khan	147	4,684	168	5,373	186	6,183	303	8,380	307	8,669	306	8,656
Chumphon	5	180	5	302	33	1,413	47	3,108	149	6,197	175	7,319
Surat Thani	53	3,410	312	19,054	456	23,098	601	30,355	979	41,550	1,000	51,069
Nakhon Si Thammarat	668	44,665	704	46,242	723	47,220	921	50,644	1,434	52,489	2,609	57,615
Songkhla	-	-	-	-	-	-	4	284	10	1,169	354	3,483
Phatthalung	-	-	-	-	-	-	-	-	1	20	2	24
Pattani	-	-	-	-	7	1,160	10	1,277	35	2,261	64	4,130
Narathiwat	-	-	-	-	-	-	-	-	-	-	-	-
Ranong	-	-	4	14	1	7	1	12	3	27	27	804
Phangnga	-	-	-	-	-	-	-	-	23	253	34	726
Phuket	-	-	4	142	5	145	9	212	16	459	24	1,099
Krabi	6	210	4	140	10	206	11	224	12	266	39	372
Trang	-	-	-	-	-	-	-	-	19	356	20	371
Satun	15	535	22	1,325	65	5,463	65	5,463	96	5,795	94	5,777

Department of Fisheries, Thailand.



### **Shrimp culture in a suburb of Bangkok**

Samutsakorn which is located about two hours drive southwest of Bangkok, was one of Thailand's major areas for intensive shrimp culture between 1987 and 1990. This area also became popular as an industrial estate site at about the same time because of its proximity to Bangkok. The growth rate of the Thai economy accelerated after 1987 and at the same time, the investment in and around Samutsakorn also increased rapidly. One manifestation of this was that entrepreneurs began to buy land in the area and some of it was converted into shrimp ponds. As a result of these investments, the price of the land skyrocketed.

People who entered the shrimp culture business were as follows:

1. Farmers originally residing in this area who converted some of their own land into intensive shrimp ponds.
2. Farmers who had suitable land for shrimp culture but didn't have the capital to set up the ponds, and therefore found sponsors, who were often businessmen from Bangkok.
3. Businesses or individual businessmen who purchased land in Samutsakorn.

The businessmen knew that the price of land there would increase quickly and substantially so that they would not lose money even if the shrimp farms were unsuccessful. So land speculation was one reason why so many people started intensive shrimp farming in this area. In fact, the demand for land became very high after 1988, and factory site and land owners made big profits.

Most of these new shrimp farmers lacked the technical background necessary for intensive shrimp culture, and not all farms were able to make a profit. The brokers who supplied the materials and equipment for shrimp farming became a main source of knowledge and

information for shrimp farmers on the techniques of intensive shrimp culture. They also supplied water pumps, aeration devices, artificial bait, chemical material and medicine etc. There had previously not been many of these brokers in Thailand, but with the shrimp culture boom, the number increased rapidly. New graduates who had majored in aquaculture or fisheries chemistry were in high demand and were recruited by the many companies which dealt with the shrimp culture business.

Workshops and training courses on intensive shrimp culture organized by the governmental sector were inadequate for the sudden increase in demand after 1987. On the other hand, big artificial bait companies were likely to hold technical workshops for shrimp farmers because they wanted to promote their products. They also established research laboratories to analyze shrimp disease and water quality management. Most of these company investments were relatively large and were often accompanied by the construction of their own shrimp ponds in the south of Thailand. These farms were usually on a huge scale and included hatchery facilities as well.

As a result of the rapid increase in the number of intensive shrimp culture establishments in the Samutsakorn area over those years, the incidence of shrimp disease and subsequent decrease in productivity became a serious problem. The cause of these problems was the lack of farmers' technical knowledge in that field. Generally speaking, for the first couple of years the operations went well but after that shrimp disease appeared. This indicated that pond management was not being carried out properly. As the farmers often got technical advice from the suppliers of artificial bait, pharmaceuticals and chemicals, they were also more likely to overuse these materials.

Another suspected cause of disease was the slow speed of irrigation channel flow. Most sites were very flat and the slope of the channels was not steep enough to ensure a good and sufficiently fast flow of water. As a result of this, sediment did not flow away with the effluent.



By 1990, most of the farms in Samutsakorn had closed down their shrimp culture operation. The financial damage for the individual owners was serious. The Thai Department of Fisheries stepped in at this point, and provided a budget to improve the channel flow, but after 1987, the siting of new factories in the area had accelerated, and so polluted water drained from these factories to the ponds. So this was another possible cause of shrimp disease. However, some shrimp farmers still believed that the main reason for their failure was poor pond operation.

In Thailand, the techniques for intensive shrimp culture were only introduced in the late 1980's and expertise was not well established. The pond managers in shrimp farms still repeated mistakes. The origins and mode of spread of the shrimp disease were unclear and so once it was present, they had no solutions to the problem and eventually closed the ponds.

In the research laboratories of the Department of Fisheries in Samutsakorn, studies of shrimp disease were implemented, and continue, with many researchers and biologists trying to find the mechanism of the disease, but it is not simple to clarify.

The industrialization in the area will continue and the development of industrial estates makes it difficult for shrimp farming to exist. Simultaneously, the natural environment is no longer as suitable for shrimp farming because of the lack of good quality water and pollution from effluent.

#### **Shrimp culture in southern Thailand**

The towns of Surat Thani and Nakhon Si Thammarat are in another major shrimp farming area in the south. This region's area of shrimp ponds was extended rapidly unlike in the Samutsakorn area. It is noticeable that these shrimp farms were established by big agro companies. Many of the farms are large scale and the investment is huge. The companies were originally the producers of artificial shrimp bait and they began large scale shrimp farming using their own

bait products. The south is not yet fully industrialized and the price of land is still relatively low compared to the suburbs of Bangkok, so that it is relatively easy for big enterprises to acquire extensive areas of land and construct large scale shrimp farms. These areas had previously often been used for salt farming or as paddy fields.

One major Thai company which mainly focuses on the agro business, established large scale shrimp farms in Surat Thani and Nakhon Si Thammarat. The latter has an extension service annex which neighboring farmers can take advantage of. In Thailand, the enterprises which operate large scale shrimp farms are also the producers of artificial shrimp bait for the small scale shrimp farmers. They, therefore, cooperate with individual farmers by instructing them on culture techniques, but their main objective is to sell artificial bait to these farmers. If in the future, the supply of cultured shrimp exceeds demand, the relationship between the big producer and individual farmers may change, but at the moment it is profitable for both. Individual farmers buy artificial bait from big producers and sell cultured shrimp to those who have freezing facilities.

In the south, there are so few factories that the problem of environmental pollution is not yet serious. This is one of the advantages for the large scale shrimp farmers. It is not easy however, for them to get large areas of land which are absolutely ideal for shrimp culture, and so they are often in areas which are not perfectly suitable. A stable and sufficient supply of water is one of the main difficulties. The black tiger shrimp grows faster in brackish water than in sea water, but, it is difficult to guarantee a continuous supply of brackish water to the large size shrimp ponds. The big farms therefore use sea water which is brought in from offshore through a pipe. The growth rate of the shrimp is slower with sea water but there is less chance of disease. Even if neighboring shrimp farmers release contaminated water, the shrimp farms which use sea water, instead of brackish water taken from a common channel, are unlikely to be affected by infections. This guarantees more stable production and less worry about the quality of water supplied to the big farms decreasing in the long term. If the farms set up appropriate waste water treatment facilities for drainage water before releasing it into the sea, there will be less damage to the natural environment.



However, this system presents problems which affect neighboring land. This area used to be rice fields and there are still many around the shrimp ponds. If the shrimp farms use sea water, it is impossible to avoid contamination of the adjacent rice fields by the sea water. Sooner or later, these rice fields will become unusable and the rice farmers will probably try to convert their land into shrimp ponds as well. In the south, the rice farmers can make roughly 2,000 baht per rai (1,600 square m.) profit annually. Productivity from shrimp farming is much higher. In Thailand, it is possible to harvest shrimp crops at least twice a year, though the growth rate of black tiger shrimp becomes slower if reared in sea water. Although productivity depends largely on the management and technique of the pond operator, it is assumed that 1 MT of shrimp can be harvested per rai; 2 MT of shrimp is the normal annual yield. Assuming the pond price of the shrimp is 150 baht per kg, there is a potential annual income of 300,000 baht. The initial set-up costs and production costs are very high, but then, compared to the profit from the rice field, the potential profit of intensive shrimp farming is huge. For this reason, most of the rice farmers are very keen to begin shrimp farming, but they lack the capital for the initial investment.

To meet the aspirations of the individual rice farmers, one of the major bait companies began a unique shrimp farming project. The farmers are allowed to own their land and borrow the initial cost of pond construction, with supervision of the operation and management help from the company. The result is highly dependent on the ability of whoever is in charge of the pond operation. It is very difficult to standardize operations because of unpredictable factors such as rain fall, sudden change of temperature, or unusual water quality and supply etc. Generally speaking, it is assumed that the pond operator who owns his own pond will make a greater effort than the pond operator who is employed by a company. This is the reason several major companies have decided not to buy the land but to let the farmers operate their own ponds with individual risk. In reality, however, the individual farmers in this system are very much under the control of the company too. All the set-up costs of making ponds, and often the operating costs too are born by the company and farmers are



expected to pay this back from their harvest. It will be interesting to see how these rice farmers, now changed to shrimp farmers, survive under the financial control of the big company.

When one of the big companies opens a large scale shrimp farm, which includes the freezing factory, over five hundred employees are recruited in the area without much difficulty. This indicates that in the south, there are quite a number of unemployed people particularly women. In the south, work availability is limited, therefore, non-skilled workers are not likely to move so readily to other jobs compared to workers in Bangkok. The minimum wage in the south is lower than Bangkok, and as frozen shrimp factories require a lot of workers, the cost of wages is a big factor in the profitability of the businesses.

The governmental sector of the provinces in the south is now becoming more aware of environmental issues, and the possible damage to the environment from intensive shrimp culture is one of their main concerns. Restriction will therefore become more severe as time goes by, and the production side is required to develop culture techniques which cause the least negative effect on the environment. However, the cost of investment for drainage is high. Most of the individual shrimp farmers don't have the capital to set-up the required treatment for drainage, and they are largely unaware of environmental issues. In practical terms it is only the shrimp farms operated by large companies that have the capital and motivation to invest in the least harmful shrimp production cycle. From now on, the issue of environmental destruction from shrimp culture will be more controversial, and individual farmers will not be able to ignore the damaging effects of their drain water.

#### **Shrimp farming cooperatives**

There is a shrimp farming cooperative in Surat Thani province which was established with the support of the Ministry of Agriculture and Cooperatives of the Thai government. This project was granted a 10,000 rai area of national land suitable for shrimp farming.

Qualified people applied for membership of the cooperative and each borrowed about 20 rai of the land. At present, there are 475 members and as there is no more available land, new applications are not being accepted. The qualifications for membership of the cooperative were as follows:

- 1) Local farmers or fishermen
- 2) A person with no debt
- 3) A person who does not own any land (in principle)
- 4) A person who is over 25 years of age

The accepted members were required to pay 200 baht per rai at the beginning, with no additional rental fee afterwards. The transfer of the land use rights is allowed to their own child with no fees exchanged.

This project was initiated in 1975, and since 1981, with funding from the Asia Development Bank and World Bank, the cooperative has lent money to its members at an 11% interest rate. The maximum amount for each member was 160,000 baht. Since then, semi-intensive culture has been started by the cooperative members. At that time, this amount of money was enough to set up a 20-rai area of semi-intensive shrimp culture pond. Since 1988, however, intensive culture has come to the attention of the shrimp farmers in the south, and the cooperative members want to convert their ponds to intensive culture.

To assist, the cooperative has offered loans of up to 300,000 baht for each member at a 12% interest rate payable over 10 years. The financing was from the Asia Development Bank's fund. In 1981, as the number of members was only 164 people, the cooperative could offer the loans to all its members. By 1988, however, because of limited loan resources, the cooperative could offer loans to only 30 members whose projects were considered the most promising. The members of this cooperative do not own the ponds and, therefore, without collateral cannot get a loan from another bank or finance company.

For the other members of the cooperative who are not amongst the selected 30, it is very difficult to get money to convert their ponds for intensive culture. As a result, though most of them want to convert their ponds into intensive culture if possible they still operate semi-intensive culture. It takes approximately 300,000 baht to build a 5-rai intensive culture pond. So the members who did get the loan of 300,000 baht from the cooperative, can change only one 5-rai pond into the intensive system and the remaining land is used as a reservoir.

When the cooperative started to lend land to its members, an irrigation channel was constructed with a budget from the Thai channel was constructed with a budget from the Thai government. The channel remains in good condition still because the number of intensive culture ponds in the area is limited. If all the members begin intensive culture, the capacity of the channel will not be enough. The cost for channel improvement is high, but even if the cooperative can get a budget for channel improvement, they should not allow the number of intensive ponds to increase rapidly. In the long term, keeping the present situation may result in more stable production.

Besides the loan, the cooperative offers its members marketing services for the harvested shrimp and the facilities to purchase artificial bait, materials and equipment for culturing. The collecting and sorting place for product is next to the cooperative building; harvest collections are made from the farmers 20 times a month on average. The maximum handling ability of this facility is 3 MT a day. The collected shrimp is transferred to the Samutsakorn fish market by a truck which is borrowed from the government. After auction, the profit from the sales is returned to the each member after deducting 4% for handling charges.

There is also a factory to produce artificial shrimp bait in the cooperative. The process is largely automated and produces bait for members that is slightly cheaper than the first quality bait produced by the big companies. However, as the type and quality of ingredients makes a big difference to the growth rate of the shrimp, the merit of having their own bait factory is debatable.



## Summary

In the past half decade, the industrialization of Thailand has progressed rapidly; one of the main contributory factors has been the quick growth in foreign investment. As a result of this investment, Thailand has developed its secondary and tertiary industries substantially, while, the importance of primary industry has remained unchanged. The consequent further concentration of population in the capital city, Bangkok, has already caused a decrease in the quality of life for its inhabitants. For poor class Thais, the living conditions in Bangkok, public transportation, air pollution, housing circumstances etc. are worse than up-country. The people who have come to Bangkok to work from up-country have serious complaints, but they cannot find jobs in their home towns.

For the time being, industrialization around the metropolitan area is expected to continue. The Board of Investment of the Thai government is trying to develop rural area, and gives privileges to foreign investors if they establish new projects up-country, but the infrastructure in these areas is still poor, and foreign investors are therefore often reluctant to initiate industrial projects in these areas. In the longer term however, this negative factor will be improved and new investment will probably spread all over the country.

Intensive shrimp culture is an option for economic development in rural areas, and is an industry that does not require foreign capital and technology for its development. In addition, intensive shrimp culture is a relatively high profit business compared to other agricultural sectors, and frozen shrimp is already one of Thailand's major exports. A frozen shrimp factory also contributes to higher employment levels in its area because it requires quite a number of unskilled female workers.

Some of the nation's leading companies are eager to expand their profit from the shrimp culture business. One particular influential agro company in Thailand is becoming dominant in this sector. The company takes part in all aspects of the shrimp business; production of artificial bait, huge scale intensive shrimp culture, extension services to the individual farmers, collection of reared shrimp, the operation of freezing factories and exporting. There is the fear for the individual farmers that the price of cultured shrimp could be manipulated by these companies. On the other hand, the technology to produce the high quality bait and technical services which they provide are a contributory factor in the farmers' success.

Family operated farming is less expensive than big company operations, and this economic factor will be the most important factor in the future because production in other Asian countries is increasing and their prices are becoming very competitive. Thai farmers are therefore required to produce shrimp at least cost. Under these circumstances, family operated individual farms have advantages over company operated farms.

However, the farmers need to learn more appropriate methods of operation. It is essential that they improve the culture system so that repeated use does not decrease the soil quality of the ponds nor effect the environment with polluted effluent. If they can implement such good practices, Thai shrimp farmers will be able to survive among competitive world shrimp producers in the future.

### References

Fisheries Statistics, Department of Fisheries, Ministry of Agriculture and Cooperatives.

Economic Analysis of Giant Tiger Prawn Culture in Thailand. Panipa Hanvivatanakit. Asian Fisheries Social Science Research Network, Fisheries Policy and Planning Division, Department of Fisheries, 1988.

Bangkok Post Economic Review.

The Nation.

