

## BANGOS PEN CULTURE AND OPERATIONS

by

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### History

The fish pen industry originated at Seto Naikai, Yashima Bay and Sikuko Island Seas in Japan. In these areas octopus are cultured in boxes or cages while yellow tail are cultured in impound nets or floating pens, in pens and in barricades.

In the Philippines, this industry was started by the Bureau of Fisheries and Aquatic Resources (BFAR) along the shorelines of Laguna Lake in Barrio Patunhay, Cardona, Rizal, from 1965 to 1967. Carp, tawes, goby and bangos were cultured in fish cages and floating pens. This was inspired by the result of the "bangos stocking program" launched by the Bureau of Fisheries from 1957 to 1959. Evaluation showed that 3-month old bangos measured 30-49 cm long, 2 to 3 pieces to a kilo. After 8 months, samples landed measured 65-80 cm long and weighed 2-3.5 kg per bangos.

In 1970 the Laguna Lake Development Authority (LLDA) tried the idea in a 28-hectare commercial area by enclosing a shallow cove in Sitio Tadalak, Barrio Looc in Cardona, Rizal. The following year, a group of "Balikbayan" from Vietnam pioneered a 40m x 40m fish pen made of woven bamboo splits (baklad) and nets (banatan) in Barrio Tuna, Talim Island, Cardona, Rizal with the technical guidance of the Bureau of Fisheries technical men. A very high production of 1,100 - 2,000 kg in this area was obtained.

These results encouraged many lakeshore folks, businessmen and government officials to engage in the industry. From then on, the fish pen industry gained nation-wide acceptance.

### Situation and Scope

Due to the high production within a very short period of time, the fish pen had spread. From a few hectares in 1971, it increased to 200 ha in 1972, 5,000 ha in 1973 and 7,000 ha in 1974.

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Before the BFAR took over the supervision, management and conservation of the Laguna Lake fish pens, awarding of pen sites was within the control of municipal mayors. The scramble for fish pen sites resulted to the following problems: improper location of fish pens resulted to poor production, conflicts, overlapping of sites and haphazard fish pen arrangement served as harbors for water hyacinths (water lilies) that hampered navigation.

The Bureau of Fisheries, by virtue of Presidential Decree No. 43, promulgated rules and regulations to promote wise utilization and conservation of Laguna Lake. Fisheries Administrative Orders, (FAO) 109 and 114 were promulgated.

Under Letter of Instruction (LOI) 235 the Bureau of Fisheries and Aquatic Resources was designated as the sole agency responsible for the issuance of fish pen licenses in accordance with a master plan known as a "fish pen belt". The master plan was designed to promote maximum production and conservation, to put rationale in the setting of pens and to correct the adverse proliferation of pens brought about by indiscriminate issuance of municipal permits.

#### Advantages and Disadvantages of Fish Pens

##### Advantages:

1. Very high production at very short period of culture.
2. Spaces between fish pens serve as refuge and breeding grounds of the fish to sustain natural fish production in the Lake.
3. Growing fish in pens would mean an increase in the income of the fishermen, thus, raising their living standard.
4. Increased income of the towns bordering the lake will also help improve the economic conditions of the lake shore inhabitants.

##### Disadvantages:

1. Too much risk is involved during adverse weather conditions such as typhoons and floods.
2. Risk in the selection of site; construction and management of the fish pens.

3. Risk in acquiring production inputs such as netting materials, the cost, availability, quantity, kind, species, transporting and stocking of fish fingerlings.

4. Risk in the so-called "Fish kill" (masamang tubig), a natural phenomenon in the lake.

#### Factors to be Considered in Fish Pen Operation

The major factors that should be taken into consideration in fish pen culture before the industry could be given emphasis for further expansion are:

1. How to select the site wherein conditions of pen culture would give a maximum fish production at a minimum period of time of cultivation.

1.1 Selection of site suitable for fish pen is determined by the following factors:

Fish food distribution - One of the most common causes of horizontal distribution of plankton which serves as food of milkfish is the wind action on surface waters. The wind action produces an actual drift to upper waters. Under certain conditions of drifting waters, plankton becomes concentrated in the vicinity of the shore facing the wind direction. Plankton drifts are common in Laguna Lake especially during the dry season between November and May. Sometimes such a plankton drift particularly when this accumulates along the shore in small coves, becomes so thick that the whole water is altered in color and plenty of algal scums suspend in the water coast and cover the rocks and other solid objects.

According to Mrs. Notario (1964) and Yun An Tang (1972), the average suspended organic matter which is composed primarily of plankton and plankton-produced detritus in the water of Laguna de Bay is 9.5 mg/l (on an ash-free dry basis). This is equivalent to approximately 2,400 kg/ha (by wet weight) of standing crop of primary production in the lake waters. It appears that the plankton accumulations in the region of the exposed shore would yield as much as many times in excess of the average. Therefore, selecting fish pen site in the lake waters, plankton drift due to the wind action should not be overlooked.

In order to trace the shoreward plankton drifts, the prevailing direction and the average velocity of the wind, and the estimated velocity of surface-water movement in the area of Laguna Lake throughout the year should be acknowledged.

### 1.2 Lake water circulation

It is an established fact that the presence of enough dissolved oxygen to keep the fish actively feeding is one of the limiting factors in fish production in stagnant bodies of pond water.

### 1.3 Fish waste material accumulation

In intensive fish culture where the standing crop of fish at the density of more than  $0.5 \text{ kg/m}^3$  of water, the waste materials (feces and urine, etc.) produced by the fish usually hinder the growth of the fish themselves. Generally, the water within a fish pen of average size in Laguna Lake is able to change completely within several minutes. However, if a series of fish pens covers an extensive area, the contaminated water would remain in the areas where the current becomes sluggish. In other words, when a series of fish pens are set up along the shore of the lake, fish production from these pens varies considerably depending on the velocity and direction of the water currents passing through each of the pens. Lake water circulation also affects the carrying capacity of a body of water in fish production and sometimes, also causes the death of fish from asphyxiation when the water circulation ceases.

Horizontal currents in the lake water are usually produced by wind. The velocity of the upper water movement is about 5% of the wind causing it, but it becomes lesser in small lakes. The prevailing direction and estimated velocity of the horizontal currents in the Laguna Lake are as follows: Northeast wind (amihang mura) from October-January has a velocity of 18 ft/mi; easterly wind (amihang matuwid) in February with a velocity of 22 ft/mi; southeast wind from March-May with a velocity of 26 ft/mi, and southwest wind (habagat) during the typhoon season from June-September with a velocity of 28 ft/mi.

A general feature of the year-round horizontal currents in the Laguna Lake can be graphed based on prevailing direction and velocity of the wind in the lake area. This

pattern is often modified by the shape of the shoreline and the form of the lake basin. An indication of the swiftness of the water current in the lake is the growth of vegetation.

2. The most productive size and shape of pen under various environments should be technically and economically justified in the future plan of expansion and conservation policies.

### 2.1 Productive Pen Size

Production results obtained from the BFAR fish pen operators from different sizes of pens per crop (4 mos. period of culture) are as follows:

1	<u>Pen Size</u> (in ha.)	<u>Bangos Production</u> (kg/ha)	<u>Cost of Construction/ha</u> (P/ha)
	1/6 (40m x 40m)	9,000	P54,000.00
	1 (100m x 100m)	7,100	30,000.00
	5 (224m x 224m)	6,600	15,000.00

The results showed an inverse proportion between size of pen, bangos production and cost of construction.

3. The Ecological changes in the lake.

3.1 There are environmental changes in the congested fish pen areas located close to the shoreline. When few fish pens were set in these shallow areas, good production results were obtained. However, as pens were constructed one after the other towards the middle part of the lake, the carrying capacity of pens along the shoreline and shallow areas changes as circulation of lake water become sluggish and stagnant. Hence, poor distribution of natural food resulted in the stagnant growth of bangos stock and aquatic weeds, competing for space and oxygen.

To solve this situation, the Bureau of Fisheries and Aquatic Resources established the so-called "fish pen belt". As previously stated, the belt will balance the ecological condition of the lake to maintain the maximum fish pen production. Besides, the location of the fish pen belt permits the excessive accumulation of blue green algae. This algal bloom carried by wind, waves and current just passes, the excess of which is concentrated along the shoreline facing the wind direction. Example of these conditions of heavy algal accumulations causing pollution

were experienced in Bo. Tuna and Balibago cove in Cardona in May, 1973, and in Bo. Tayuman cove in Binangonan in June 1974 where mass mortality of fingerlings and marketable bangos in fish pens set close to the shorelines. However, the fish pens located within the BFAR fish pen belt were able to escape these mass mortalities.

### The Industry

A word of caution to the prospective investor: If you have decided to invest in the fish pen business, do not invest your whole capital. That is, if your capital is to develop 20 hectares, develop first 10 hectares. Why? The rationale is that once you fail or lose in your first try due to mismanagement, wrong timing of construction and acquisition of fingerlings or due to calamity, you still have capital to try once more to recover your losses. An investor can expand as he learns to use the best and durable materials available for constructing fish pens and its operation. He should hire experienced gear makers who are experts in the industry. If possible seek technical assistance from government personnel with appropriate expertise. This way, with good luck, your venture will be economically viable.

### Literature Cited

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