

# **SITE SELECTION FOR BRACKISHWATER PONDS**



**AQUACULTURE DEPARTMENT**  
**Southeast Asian Fisheries Development Center**  
**Tigbauan, Iloilo, Philippines**

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**SITE SELECTION  
FOR BRACKISHWATER PONDS**

*Editors*

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**AQUACULTURE DEPARTMENT  
Southeast Asian Fisheries Development Center  
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## **SITE SELECTION FOR BRACKISHWATER PONDS**

### **INTRODUCTION**

The Philippines is endowed with swamplands and coastal areas ideal for fishpond purposes. Statistics shows that we have about 200,000 hectares of developed fishponds and about 500,000 more available for development. Studies have shown, however, that not all of these developed fishponds are utilized to full capacity. Many fishfarmers claim that their low pond production is due to poor soil quality, high salinity of pond water, lack of freshwater supply, high pond elevations, and many others. All these are attributed to the environment where the fishponds are located. A fishfarmer, therefore, should consider that the fishpond site is a very important factor in any aquaculture venture. No amount of expertise in modern pond management can be applied economically if the "fishfarmer is forced to fight nature in order to give the optimum conditions" for his cultured species.

### **RATIONALE**

With 7,000 islands surrounded by rich coastal and estuarine waters, the Philippines is a good setting for aquaculture. Statistics show that wide areas had been developed into fishponds. But not all of these developed fishponds are fully utilized. Many have low production. Some causes of this problem are due to some factors which were not considered during site selection. Fishfarmers therefore, should be alert in selecting a suitable fishpond site.

The fishfarmer has two choices in determining the site for his fishpond. He can choose:

1. a site to suit the species to be cultured, or
2. the species to suit the site already obtained or ready for development.

## OBJECTIVES

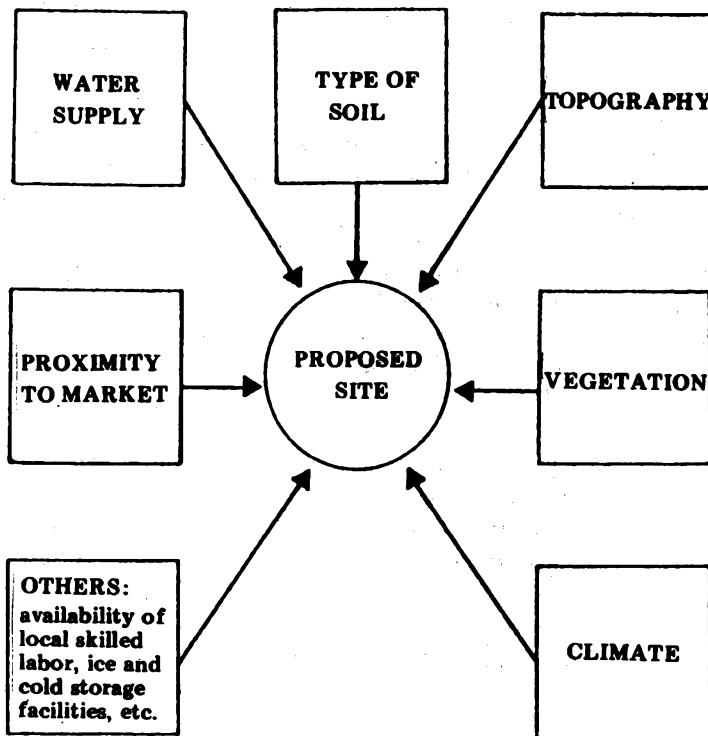
This module is intended as guide in selecting a good site for a brackishwater fishpond. It is intended to enable the fishfarmers to:

1. determine adequate and good quality of water supply for the fishpond;
2. identify suitable type, texture and quality of pond soil;
3. select desirable land elevation for fishpond purposes;
4. consider suitable climatic conditions prevalent in the area;
5. select area where vegetation indicates good soil type, elevation and salinity of water; and
6. consider other factors such as proximity to market and source of fry, availability of local labor, ice and cold storage facilities, fertilizers and construction materials.



## FACTORS TO CONSIDER IN SITE SELECTION

The different factors that have to be considered for choosing a suitable site for a brackishwater pond are: water supply, type of soil, topography and ground elevation, vegetation, climatic conditions, proximity to market, and others like availability of skilled local labor, ice and cold storage facilities, construction materials, etc.



**FACTORS IN SITE SELECTION  
FOR BRACKISHWATER PONDS**

## WATER SUPPLY

Water supply is the most important factor to consider in determining the suitability of a fishpond site. It should be adequately supplied and available the whole year round. Water should be moved in and out of the pond system if possible by gravity without additional power input. For example, water enters the pond during high tide, and drain out during low tide.

Because the predominant factor responsible for the tides is the moon's gravitational attraction, the fishfarmer should have a basic understanding of the tidal fluctuation in relation to the lunar cycle and how it affects the availability of the water.

Physical properties of the water supply also contribute to fish growth. Water temperature should suit the requirement of fish under cultivation.

The chemical properties of water should be checked to promote favorable fish growth. Certain species require certain salinity and temperature ranges. Water should also be well oxygenated. Cool water with low salinity contains more oxygen.

The water should also be free of pollutants and toxicants from industrial plants and run-off from upland farms using pesticides. It should contain adequate nutrients necessary for algal and plant growth.

### Optimum Salinity and Temperature Range for Various Species

<u>Species</u>	<u>Salinity (ppt)</u>	<u>Temperature (°C)</u>
Milkfish	20-30	24-30
Mud Crab	23-32	23-32
Prawn ( <i>sugpo</i> )	18-25	26-30
Tilapia	10-15	22-35

Biological properties such as the presence of microorganisms in water are also important for a balanced pond ecosystem. Nonpathogenic bacteria should be the dominant microorganisms in the water. The presence of planktonic organisms in the water provide food for fish.

## SOIL

Soil is an important factor in fishpond productivity because of its ability to adsorb and release the plant nutrients needed by phytoplankton which is the natural food of fish. It is the main and most economical source of dike-building materials. Furthermore, the quality of the water is highly affected by the nature of the pond soil.

The textural properties of soil determine how well-suited it is for fishpond purposes. Generally, clay, clay-loam, silty-clay-loam, silt-loam, loam, and sandy-clay loam are the preferable kinds of soil for fishpond sites.

Sandy-clay-loam is the best for diking purposes. A high percentage of clay is desired because it has the largest surface exposed to chemical and physical reactions. Chemical and physical reactions stimulate the growth of plankton and helpful bacteria.

The textural group of soils can be determined by the "touch-and feel" method. Here's how to do it: Handle a piece of soil material. If it is wet and sticky, knead it in the hand to make it somewhat drier. When it is drier or just moist, add some water to make it wet but not sticky. If after kneading, the sample can be rolled into a bar which is about as thick as a pencil, and bent around the thumb without showing cracks, it is clayey.

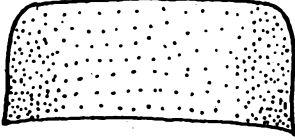
If it cannot be rolled into a coherent bar, and if it falls into separate, visible grains when dry, the sample is silty or loamy.

If the samples are loamy, sand grains can be felt distinctly even though they may not be readily visible.

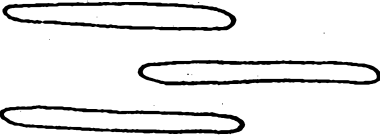
Silty samples feel like flour or dough between the fingers.

It is important to have a scientific soil analysis of the fishpond site because there are other factors such as pH level, nitrogen, phosphorous, potassium and organic matter content in the soil that are not determined by the "touch-and-feel" method.

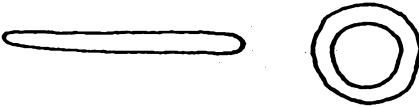
A fishfarmer may avail of the soil laboratory analysis services offered by the Soil Laboratory Center of the Ministry of Agriculture. A minimal fee of P5.00 per sample is charged for every 5-hectare area. The analysis may be finished in two weeks. A fishfarmer may also consult with soil experts in the above-mentioned laboratory when he brings in his soil sample.



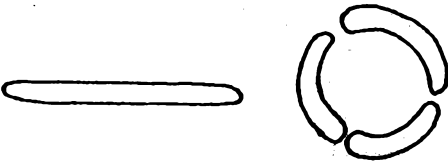
If a piece of soil material is wet and sticky, knead it in the hand to make it somewhat drier. Keep soil wet but not sticky.



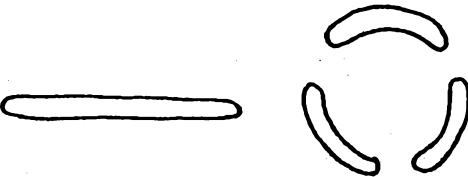
Roll soil into a bar about the size of a pencil.



If it can be bent around the finger without showing cracks: *clayey*



Not rolled into a coherent bar and falls into separate visible grains when dry: *silty or loamy*



Sand grains can be felt clearly even though not readily visible: *loamy*

If the soil feels like flour or dough between the fingers: *silty*

**"TOUCH AND FEEL" METHOD OF  
DETERMINING SOIL TEXTURE**

The following is a list of the regional and provincial/district offices of the Soil Laboratory Center of the Ministry of Agriculture and Food where you can take your soil samples for analysis:

<u>Regional Office No.</u>	<u>Location</u>	<u>Provincial/District Office</u>
1	Baguio City	Batac, Ilocos Norte Dagupan City San Fernando, La Union Vigan, Ilocos Sur
2	Tuguegarao, Cagayan	Iligan, Isabela
3	San Fernando, Pampanga	Cabanatuan City Iba, Zambales Tarlac, Tarlac
4	Manila	Batangas City Calapan, Mindoro Or. Pagbilao, Quezon UP Los Baños
5	Legaspi City	Naga City
6	Iloilo City	Bacolod City
7	Cebu City	Dumaguete City Tagbilaran, Bohol
8	Tacloban City	Catarman, N. Samar
9	Zamboanga City	—
10	Cagayan de Oro City	Butuan, Mis. Or.
11	Davao City	General Santos City
12	Cotabato City	Cabacan, Cotabato

(List obtained from Regional Office No. 6, Iloilo City as of November 1983).

## TOPOGRAPHY

Topography refers to the configuration of the ground surface. The most important thing to know about this is the amount of excavation or filling to be done if the fishfarmer has to make the desirable pond bottom elevation in relation to water supply requirements.

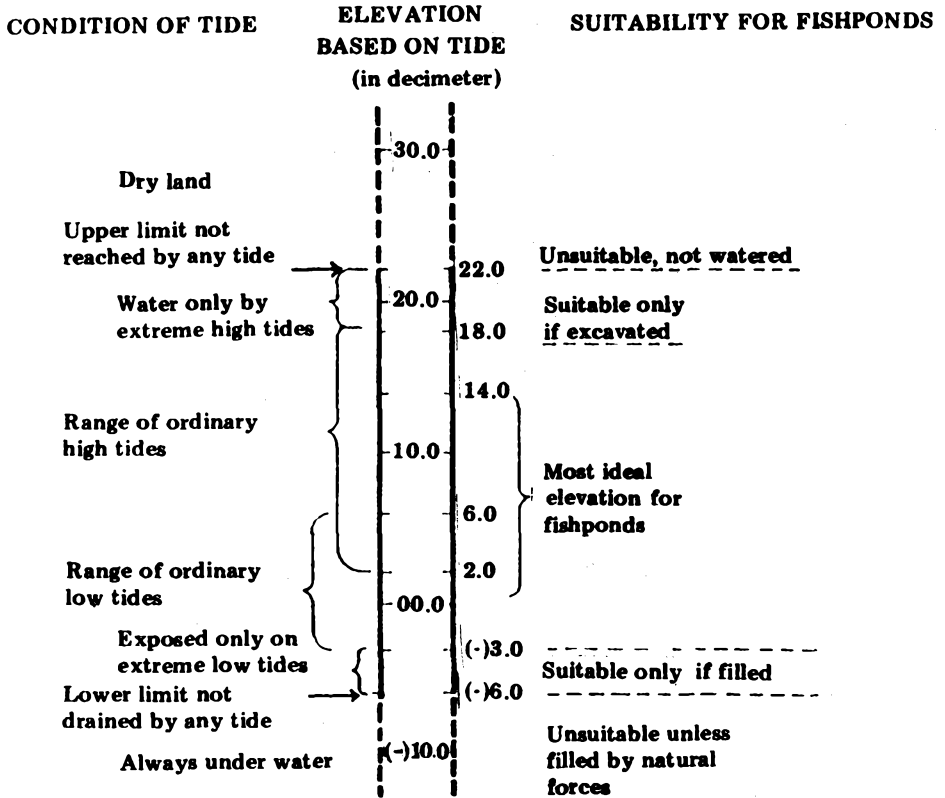
The surface level (datum plane) and the average range of tidal fluctuation in the area should first be determined.

If the pond area is farther inland, then the most practical way to estimate the surface level is to make a tidal observation of the site itself. A fifteen-day observation during the dry season for the average high water and another fifteen days at the height of the rainy season for the average low water is sufficient to ascertain that the pond system is drainable during the rainy season and the desired depth can be reached during the dry season.

After the tidal observation is done, and the approximate average lower-low level has been computed, a bench-mark can be established by running a level to a permanent marker near the site to be developed. This bench-mark can then be used as a reference point of the elevation of the area.

It is important to know the level of the lowest low tide and the highest high tide of the site. Knowing the level of the lowest low tide will help the fishfarmer determine the level of excavation of the pond bottom. If the pond bottom is higher than the level of the lowest low tide, he will not be able to drain his pond efficiently.

Knowledge of the level of the highest high tide will help the fishfarmer fix the height of his dike to prevent overflowing of his ponds during high tide or during typhoons. This will also assure him that the desired pond depth will be maintained during the dry season. The oldest resident in the locality can be a good source of information regarding the lowest low tide and the highest high tide near the proposed site.



SUITABILITY OF MANGROVE SITES FOR FISHPOND CONSTRUCTION IN RELATION TO TIDAL ELEVATION, AS APPLICABLE UNDER PHILIPPINE CONDITIONS (Rabanal, 1977)



## CLIMATE

Climate in the Philippines is classified into four weather types, namely:

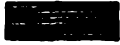
- Type I : Two pronounced seasons; dry season from November to April and wet during the rest of the year.
- Type II : No dry season with very pronounced rainfall from November to January.
- Type III : Not very pronounced season, relatively dry from November to April and wet during the rest of the year.
- Type IV : Rainfall is more or less evenly distributed throughout the year.

Data on rainfall and wind direction are important in planning the layout and design of the pond system. From the past rainfall records, the fishfarmer can more or less decide whether it will be necessary to include a drainage canal in the layout and how large it will be when constructed.

Past rainfall records will be needed in computing the heights of the dikes to effectively control flooding. Floods are considered the most destructive enemy of the fishpond industry. These are commonly due to the overflowing of rivers triggered by typhoons and the southwest monsoon rains.

The long axis of the pond should be aligned with the direction of the wind to maximize wind movement for water circulation in the pond.

**CLIMATE**



1st Type — Two pronounced seasons; dry from November to April, wet during the rest of the year



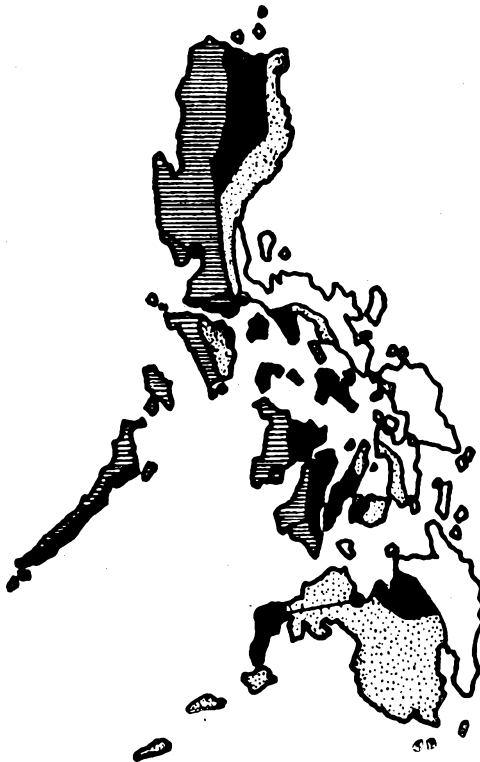
2nd Type — No dry season with a very pronounced rainfall from November to January.



3rd Type — Seasons not very pronounced; relatively dry from November to April and wet during the rest of the year.



4th Type — Rainfall more or less evenly distributed throughout the year.

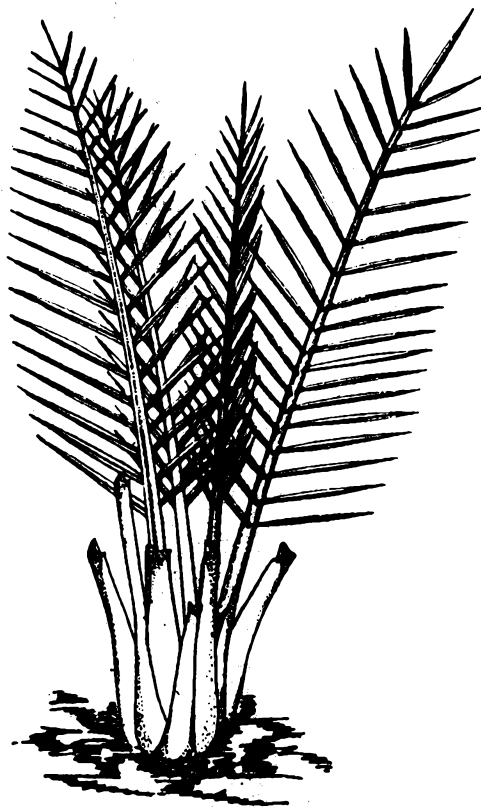


**CLIMATE MAP OF THE PHILIPPINES**

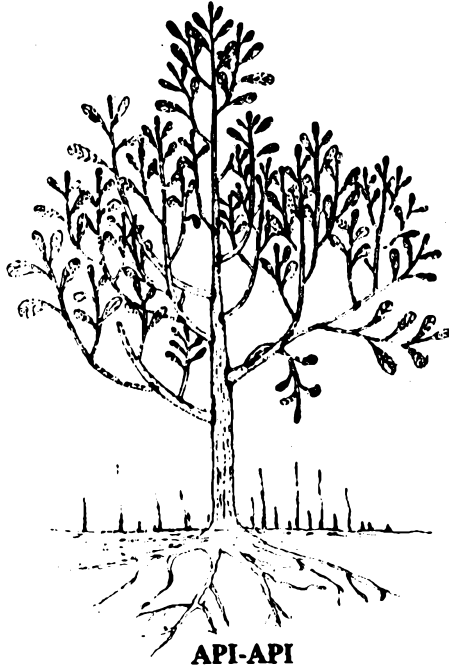
## VEGETATION

Vegetation is a good natural indicator of soil type, elevation, and salinity. It may also be an indicator of an acid sulfate soil.

Edges of tidal rivers, especially away from the river mouths, are characterized by pure stands of nipa (*Nipa fructicans*) mixed with "api-api" (*Avicennia*). This kind of area is easy to clean and is characterized by soil with high organic matter content, high clay content, and by water with low salinity. Presence of plants such as "kusay-kusay" (*Rupia* sp.) is also an indication of low salinity.



NIPA

**API-API**

Mangrove (*bakawan*) areas are very good candidates for fishpond sites. These areas are not rocky and have elevation low enough to be reached by tide waters.

Heavily vegetated areas will require more expenses in clearing.

**BAKAWAN**

## **PROXIMITY TO MARKET**

**Proximity to market is another important factor for a successful pond operation. There should be a local market nearby to take care of the fishfarmer's produce. If not, there should be available means of transport to bring the fresh produce to the market.**

**If there is no public market nearby, a method of preserving the produce should be developed.**

## **OTHER FACTORS**

**Other factors to be considered in selecting a good fishpond site are:**

- a. proximity to fry source;**
- b. availability of skilled local labor;**
- c. availability of ice and cold storage facilities;**
- d. availability of fertilizers, pesticides, etc.**
- e. availability of construction materials;**
- f. availability of credit;**
- g. a good peace and order condition in the locality; and**
- h. socio-economic status of the surrounding community.**

## SUMMARY

The different factors to consider in selecting a brackish-water pond site are the following:

1. **Water supply** — Water should be adequately supplied and available the whole year round. The physical, chemical and biological properties should be examined in order to gauge its suitability.
2. **Soil Type** — Clay, clay-loam, silty-clay-loam, silt-loam, loam, and sandy-clay-loam are the preferable kinds of soil for fishpond sites.
3. **Topography** — The most important thing to know about the configuration of the ground surface is the amount of excavation or filling to be done if the fishfarmer has to make the desirable pond bottom elevation in relation to water supply requirements.
4. **Vegetation** — Mangrove vegetation is a good natural indicator of soil type, elevation, and salinity.
5. **Climatic condition** — Data on rainfall and wind direction are necessary in planning the layout and design of the pond system. These are needed in computing the height of the dikes to effectively control flooding.
6. **Proximity to market** — There should be a local market nearby to take care of the fishfarmer's produce. If not, a way to preserve the produce should be developed.
7. **Other factors to consider** are availability of skilled labor, ice and cold storage facilities, fertilizers and pesticides, construction materials, credit, and the peace and order condition in the locality.

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