Chapter 5
Fishpond restoration

INTRODUCTION

This chapter provides information on how POs can modify abandoned or illegal fishponds to make them more valuable to the community. Illegal and abandoned fishponds can be changed in ways that are directly and indirectly beneficial to the people who restore them and to the environment. For example, fishponds can:

- Be developed into plantations that the community can in the future harvest for firewood, poles, etc.
- Provide an area to collect shells, crabs and fish.
- Provide food and shelter to crabs, shrimp, shells and fish harvested in coastal waters.

When looking at the benefits of restoring fishponds, it is evident that a restored idle fishpond is much more beneficial than an abandoned one. (Figure 5.1 shows this potential difference.)

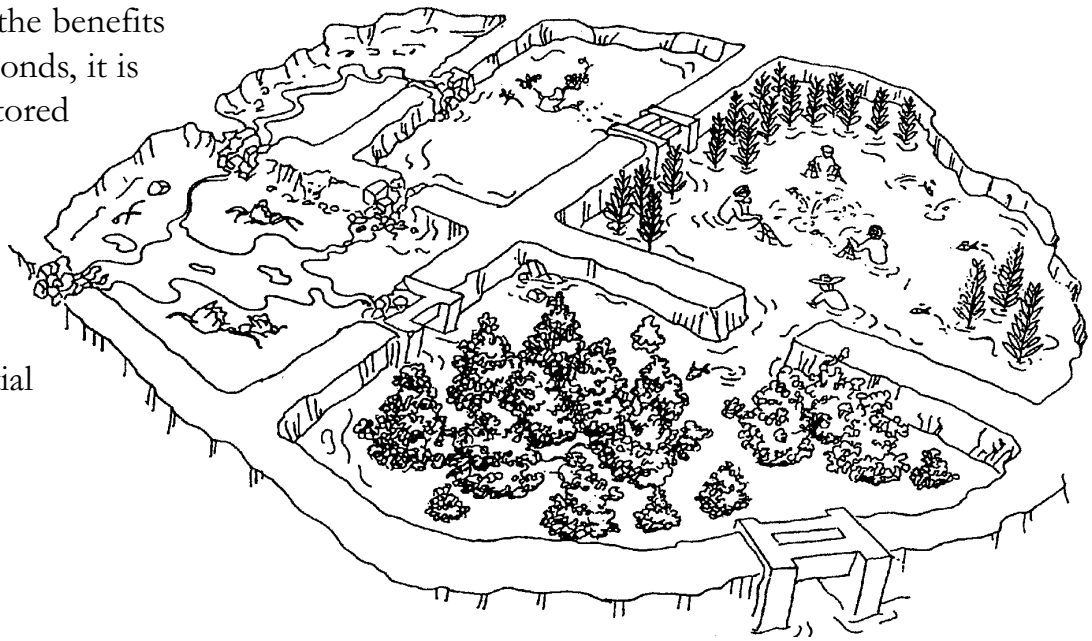

Figure 5.1. Active vs. managed fishpond.

Fishpond restoration principles and techniques are important because restoring fishponds to their former and natural state offers significant advantages to coastal systems. (Information specifically related to planting and management of mangroves is found in Chapter 3, *Mangrove Plantation Establishment and Management*.)

There is little practical experience with restoring fishponds back into mangroves. Much of the guidance in this chapter is based on sound ecological practices and an understanding of hydrology rather than on direct experience in similar situations. For example, replanting fishponds with *bakauan* or other mangrove species will eventually result in an increase in the mangrove forest area and should provide additional fish catch in the nearby coastal waters. Similarly, while still new, aquasilviculture has been proven to work in the Philippines and elsewhere on a small scale, and should work on a large scale. Suggestions are made regarding the amount of dike to remove, the placement of soil from the dikes and other construction issues. Each case will provide special challenges. The advice given here should not be followed if local experience has proven different.

A Word on Reverting Fishponds

The reversion of abandoned fishponds under a Fishpond Lease Agreement (FLA) is currently an extremely difficult activity that takes considerable time and resources to accomplish. Although Republic Act 8550 does hold out hope for an easier process, it is not clear when that will be. At this time, the Coastal Resource Management Project-Mangrove Management Component (CRMP/MMC) suggests that POs should focus their energies on illegal and abandoned fishponds within their CBFMA application area (identify the abandoned ponds under FLA, exclude them from the application and attempt to revert these ponds at a later time).

Remember

Aquasilviculture does not mean that an abandoned fishpond is rebuilt and used exclusively as a fishpond. Aquasilviculture means that the fishpond area is converted into a site where mangroves can grow and fish can thrive.

STEPS IN RESTORING FISHPONDS

As in any complicated process, it is best to break the reversion of fishponds up into several manageable bits (see Table 5.1).

The steps are designed to give the PO a general plan to approach the work necessary to identify fishponds within the CBFMA area and to determine whether to include them in the application. It is also important to establish a committee to work on this activity. Without having specific individuals assigned, it is difficult to get anything done.

Table 5.2 outlines the main situations and potential outcomes for fishpond reversion.

At a minimum, the former ponds that can be included will be useful as plantations. Simply operating them in that manner will gain some benefit for the coastal fisheries since a greater area of mangrove forest now is available to fulfill its natural functions.

Locate All of the Fishponds

The purpose of this step is to make certain that all ponds have been identified and located to the satisfaction of everyone in the PO. It serves as the basis for going into the field and verifying the location and current activities at each pond. In the case of small CBFMA areas (less than 200 hectares), there may be only one or two fishponds (either active, abandoned or illegal); large

Table 5.1. Fishpond restoration process.

	Steps	Result	Time to accomplish
1.	Conduct an inventory of all the fishponds (active and inactive) in the CBFMA area.	A list of all the fishponds in the CBFMA area that includes their status and who operates them.	Less than 2 weeks
2.	Visit the illegal ponds and sketch each one.	A series of sketches of each of the illegal ponds showing general location of dikes and water control structures.	Less than 2 weeks
3.	Categorize the ponds.	Based on the information obtained in step one, determine which ponds may be subject to reversion (and exclude those from the CBFMA application) and which ones may be illegal.	About 1 day
4.	Apply to the DENR to restore illegal and abandoned fishponds	A letter to the DENR through the LGU (copied to BFAR) requesting that the illegal and/or abandoned fishponds be turned over to them for restoration.	Less than 1 week to write and submit letter followed by follow-up visits
5.	Develop a restoration plan for each of the turned-over fishponds.	After getting more information, clearance or authority over the area, a plan indicating where dikes should be breached, how much soil must be removed and where pond elevations should be changed. It shall be prepared by a Technical Working Group (TWG).	1 month (assuming two to four individual ponds)

Table 5.2. Vegetation cover and potential (see Figure 5.2 for mangrove coverage approximation).

Main situation	Potential outcomes
Lightly vegetated pond with dike system (<25% vegetation cover)	Plantation of bakauan or other appropriate species. Potential for enrichment planting on dikes and other areas. Aquasilviculture possible.
Moderately vegetated pond with dike system (25-50% vegetation cover)	Plantation of bakauan or other appropriate species. Potential for enhancement planting on dikes and other areas. Aquasilviculture possible.
Heavily vegetated pond with dike system (>50% vegetation cover)	Enhancement planting in pond, on dikes and other areas. Aquasilviculture possible.

CBFMA areas may have several fishponds present.

The location of each pond can be found in the prepared CBFMA by the PO's approved survey plan duly authenticated by the DENR and BFAR records on FLA reports and using it to verify the location and extent of each pond. The map will supply information on whether the fishpond is active or inactive and legal or illegal. These and other information will be used when the fishponds are categorized later. Once everyone agrees on the locations of the illegal ponds that might be used, a group must be selected to visit and sketch the ponds.

Sketch the General Shape of Each of the Ponds

This step is important because knowing the size, amount of damage and other pond information will help the PO determine what to do once the ponds have been reverted. The information to be gathered at this stage is:

- The size and shape of the ponds
- The state of the dikes and water control structures
- The extent of mangrove growth expressed as percentage of cover of the area (see Figure 5.2 for examples of area coverage)
- The location and approximate depth of holes, channels and high spots in the ponds
- Whether or not the ponds are operational

The group should develop a sketch map for every illegal fishpond including all of the information discussed above. (See Chapter 6, *Resource Mapping of Mangroves,* for information on how to complete a sketch map.)

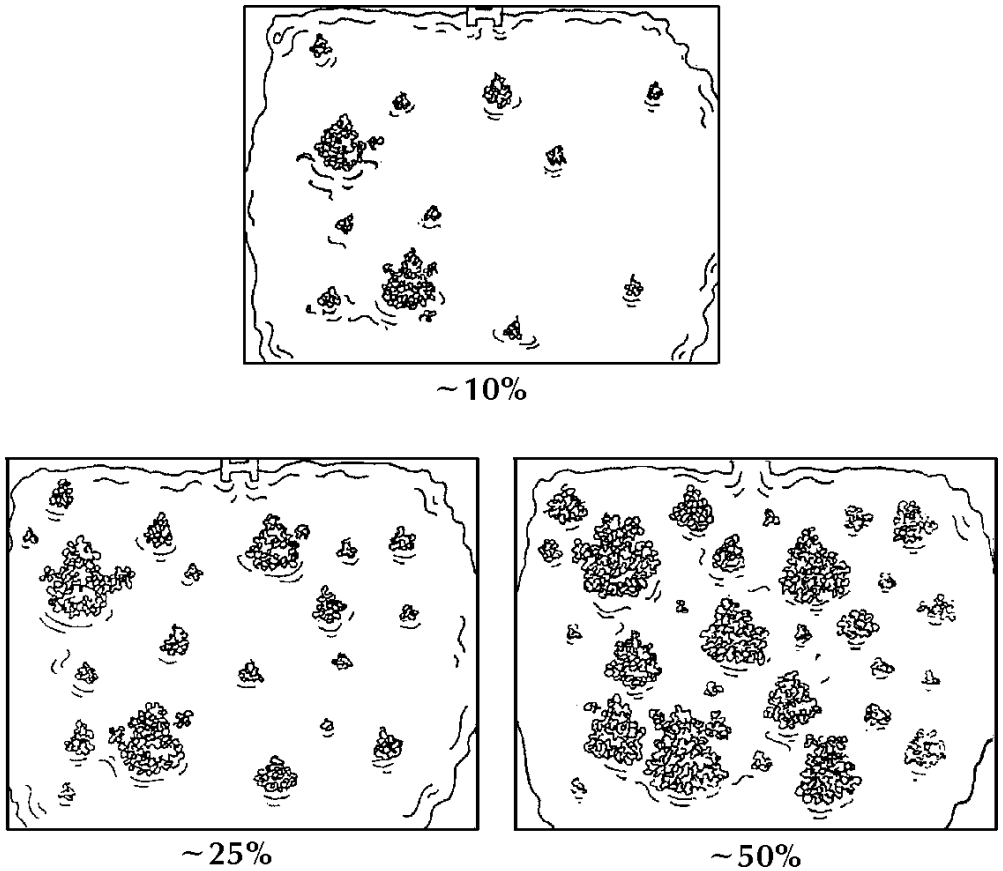

Figure 5.2. Mangrove coverage approximation.

Whenever possible, staff from the Forest Management Service, DENR, should be asked to assist with this estimation.

Categorize

Putting each pond in a category will help the PO decide which ponds to include in the CBFMA application. This is an extremely important step since much time and effort can be used in attempting to restore ponds possessing legitimate Fishpond Lease Agreements (FLAs).

The PO begins to categorize the ponds as part of the community mapping activities that were done during the CBFMA application process. All of the fishponds will have been identified in the area and marked with one or more of these codes:

- A11—Legal fishpond
- IS1—Abandoned fishpond
- IS26—Illegal, active fishpond
- IS26a—Illegal abandoned fishpond

These codes serve as the basis to help the PO understand whether to apply for restoration. Table 5.3 shows the other major categories and provides the codes of each. While these codes are a little confusing at first, they provide the PO with a wealth of information.

In general, the members of the PO will be able to quickly determine which ponds are legal and which are illegal. In cases of uncertainty, check with BFAR. The PO should focus efforts on including only illegal ponds in its application. The reversion process as it currently operates in the Philippines is extremely long and difficult to implement. The PO can conceivably be tied up in court cases for years over an attempt to revert a small pond.

Don't Forget

1. ***The PO may not begin any work on the area until the DENR or the LGU has issued the appropriate authorization.***
2. ***Without a plan, the PO will waste large amounts of time and manpower on work that probably does not need to get done.***
3. ***Emphasize the importance of developing a plan and following it.***

Table 5.3. Categories of fishponds.

Type	Category	Suggested action
Legal - Active	A11-a	Cannot be included in CBFMA application. Note location and exclude from map.
Legal - Non-working	A11, IS1	Should not be included in CBFMA application. Note location and exclude from map. Consider applying for reversion at a later date.
Legal - Unmodified	A11-u	Should not be included in CBFMA application. Note location and exclude from map. Notify DENR of the lack of activity and consider applying for reversion at a later date.
Illegal - Active	IS26	Notify LGU and request that the land be awarded to the PO for inclusion in the CBFMA.
Illegal - Abandoned	IS26a	Notify LGU and request that the land be awarded to the PO for inclusion in the CBFMA.

Report Illegal Fishponds

After the illegal fishponds have been identified, the PO can take one of two approaches. In the first approach, members can approach the illegal operators and encourage them to join the organization. One of the requirements of joining would be the turnover of the illegal pond to the PO for inclusion in the CBFMA application. This is by far the preferred way since it does not require taking the operator to court.

If the illegal operator is unwilling to join the PO, then the members must approach the DENR or the LGU to request that the operator be notified of the operation's illegality. Joint Memorandum Circular 98-01 (signed by the Secretaries of the DENR and the Department of Interior and Local Government [DILG]) authorizes LGUs to take steps to protect forest areas, particularly mangroves, by delegating certain responsibilities from the DENR to the LGUs. It may be possible to request direct assistance from the LGU.

If it must be done formally, then the PO should write a letter to the LGU (with a copy to the DENR) outlining the problem. The PO should indicate that it:

- Has identified an illegal fishpond in an area of timberland.
- Wants the operator of the fishpond to be required to cease operation.
- Wishes to include the area of the illegal fishpond in its CBFMA application.

Since this has not been done very much (if at all), it is impossible to determine how long it will take for the land to be turned over to the PO. At a minimum, DENR or LGU staff will have to investigate the area and make a recommendation. If it appears that the turnover will take an unreasonable amount of time, the PO should give serious thought to applying for the area without including the illegal pond(s).

Develop a Restoration Plan

At this point it will be necessary to revisit the fishponds. The purpose is to see what can be done with each fishpond. Visit on a low tide and then on a high tide so everyone can see what areas are exposed and what areas are flooded to get an idea of the depths of the ponds and the elevations of dikes and other high areas. (See Chapter 6 for information on how to use tide tables and water levels to measure depths and elevations.) This visit is an excellent opportunity to start thinking about what might be done with the area (see Figure 5.3).

After a site visit, the team will have gathered

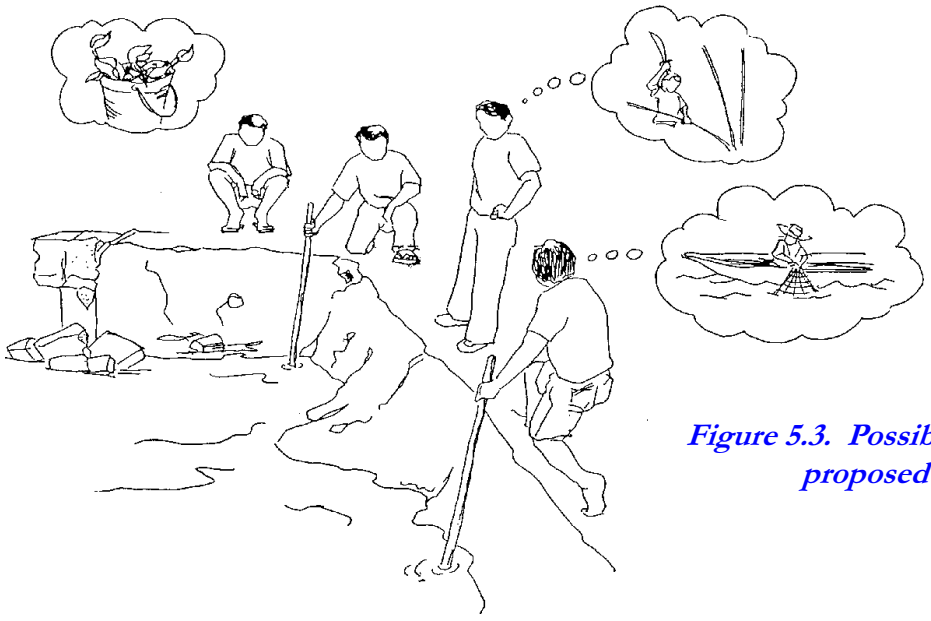

Figure 5.3. Possible activities in the proposed site area.

additional data about the flow of water near the ponds, water depth in the ponds, low and high spots at the site and existing vegetation cover. The team should also begin to think about possible approaches to modifying the flow. This information forms the basis of the reversion plan for the pond.

Hint

It would be a good idea to invite BFAR and DENR extension agents on these visits. They can provide the PO with valuable information on fisheries and silviculture.

One of the most important things the group must think about is how to make the water flow more useful to both the activities they want to perform in the pond and in the plantation areas surrounding the pond. Consider the following when thinking about water flow:

- Carefully map out (including direction of flow) natural water flow (adjacent rivers, creeks, sources of freshwater runoff from uplands, etc.), water supply channels, gates, low spots in dikes, gaps in dikes and other features.
- Try to make the water flow and movement more like it was before the ponds were built (by making openings in dikes, unblocking creeks or channels, etc.).
- Look for anything that has greatly changed the water flow. For example, a dike might have been built across a major creek. Breaking the dike at that point will allow the water to flow through the creek once again.

Be sure to consider the effects of the pond dikes on the non-enclosed areas of mangroves adjacent to or near the pond. For example, a pond might have a large supply channel built from a nearby creek to the pond. The pond might already be experiencing a good supply of water on every tide because the control structure has been washed away and the dike breached. In such a situation, it might be tempting to conclude that everything is all right with the water flow to the pond. However, when the pond is evaluated more carefully, one often finds a stretch of the old dike blocking the flow to many hectares of mangroves that are behind, but outside, the pond. If so, do whatever can be done to get better flow back to that area behind the pond.

A Word About Tides

Knowing the average level of the tides in the pond area is important. To aid drainage, most fishponds were designed so that their bottoms are slightly higher than the low tide point. Knowing the average high tide will let you determine how much of the dike needs to be removed for proper water flow.

The restoration plan need not be long or complex, but it should incorporate a minimum amount of information including:

- Proposed activities for the fishpond area. (Will it simply be a wood production plantation? Will there be a mixture of tree species planted? Is aquasilviculture going to take place?)
- Extent to which the water flow will be helpful to other parts of the plantation. (Are there areas in back of the pond that will now be reached by tidal water again? Are there areas where there may be a change in species because of a change in water depth resulting from pond modifications?)
- Proposed work to be done. (This will include a discussion of how much dike will be leveled, where soil will be placed, whether any additional excavations in the pond are necessary and any other construction activities required to accomplish the proposed activities.)
- Two sketch maps. The first showing the area as

it is now and the second indicating the areas where work will be done.

- A timetable for accomplishing the work, an estimate of the number of people and workdays it will take to accomplish and a budget.

- Putting this information together takes time. At the end of this stage, however, the group will have a good idea of what it needs to do and should be energized to do it.

Some specific examples—This section provides specific examples of the kinds of things that can be done to restore ponds. The list is not exhaustive; each pond has more than one solution that will be adequate to meet the needs of the PO. Therefore, do not feel that these are the only things that can be done.

- *Ponds with few trees*—If the proposed restoration pond has no trees at all (or less than 25% of the area has mangroves), there are a number of options to consider.

  Large bare ponds are ideal locations for planting *bakauan* species. When *bakauan* is planted in these kinds of areas, it is done so as described in Chapter 3, *Mangrove Plantation Establishment and Management*. However, there are a few things to do differently when creating a plantation in a pond:

  - Plant along dikes and canals—Ponds offer special planting opportunities because their dikes have steep slopes and offer a range of elevations to plant a variety of species. It is good to plant the edges (both sides, in many cases) of the dikes with *bakauan* species. Not only is this a place where *bakauan* will thrive if planted at the right elevations, it will help stabilize the banks. *Bakauan* also provides places for fish, shrimp and crabs to shelter, to mature and to be caught.
  - Completed ponds often have a slightly deeper channel along the pond side of the dike where material was dug out to make the dike higher. This deeper water can be the home of many valuable animals. This is particularly true if the edge of the dike is planted with *bakauan* and the prop roots and trees hang over and provide shade along the deeper water. The same thing holds for most water supply canals, because when they are dug a dike is built alongside them from the soil dug to make the canal. Planting the edges of these canals is a very good idea.

By planting the edges of pond and canal dikes, you are increasing the numbers of fish, crabs and shrimp in the area. After the *bakauan* matures, it becomes an accessible source of trees that can be sustainably thinned and harvested for poles, firewood and all the other uses for *bakauan*.

- *Enhancement planting of other mangrove species*—Even if most of a pond is to be replanted with *bakauan*, there are some places where other mangroves (*tabigi, tangal*, etc.) are a better choice, especially high spots. High spots are higher elevated areas sometimes left in the middle of a pond during its original construction or the higher parts of the dikes along the pond and canals. (Again, see Chapter 3 for information on where species should be planted.)

- *Aquasilviculture*—This is the combination of aquaculture (growing of water animals like fish, shrimp or crabs) and silviculture (growing of trees). Old fishponds can be converted to aquasilviculture allowing trees to be grown in them while providing shelter for some fish, shrimp and crabs.

- *Ponds with 25% to 50% mangrove coverage*—Natural regeneration of mangroves is a distinct possibility in these areas. If the PO wishes to pursue this option, very little must be done other than letting nature take its course.

In ponds where some trees have grown back or are still present after some fishpond construction activities, the opportunities for actively intervening are just slightly different from those described for open ponds. Plantation in open areas of the ponds is a definite possibility. Since cutting or removing the existing mangroves is not allowed, planting will have to be done in whatever open areas are remaining. It still is important to look for areas that have the right elevations and conditions for planting the selected species. The PO may find many smaller areas instead of one or two big areas to be planted. In many ponds the smaller areas add up to a substantial amount of area that can be planted with *bakauan* or some other suitable species (refer to Chapter 3 for a detailed discussion on mangrove planting). Again, the options include:

- Plant along dikes and canals. The discussion above for open ponds applies here, too.
- Even where there has been some regrowth of mangroves in an old fishpond there is often little or no *bakauan* growing there. This is due to one of two things: (1) a source of propagules does not exist nearby; or (2) *bakauan* is not as easily dispersed by the tides (compared with the small seeds of *api-api, bungalon* or *piapi*). It may be a good idea to enrich the area by planting *bakauan* propagules among the other mangrove trees that are already growing there.
- Enhancement planting of other mangrove species (*tabigi* or *tangal*, for example).
- Aquasilviculture: If the pond has the right depth and enough potential open water, it may be turned into an aquasilviculture pond as described above.

Ponds with more than 50% mangrove coverage—Extensive natural regeneration has already occurred in these areas. If it has been a very long time since the pond was cleared or if the trees inside the pond have never been cut, the options are fewer because of the current prohibition on cutting non-plantation mangrove trees. The limited options include:

- Plant in gaps
- Plant along dikes and canals
- Enhancement planting of *bakauan*
- Enhancement planting of other mangrove species (*tabigi* and *tangal*, for example)
- Low intensity aquasilviculture if there are sufficient deep areas in the former ponds

WHAT NEEDS TO BE DONE TO MODIFY PONDS

Accomplishing the various activities discussed above requires changes to dike height, water control structures and sometimes the floor of the ponds. This section discusses how to go about making those changes including the tools needed, the approximate level of effort and assessing the success of the work performed.

Modifying Dikes

Probably the most important part of fishpond reversion is the modification of the dikes. If done properly, the outcome will be an area that allows for the complete exchange of water. This will provide havens for fish and other organisms, and may allow other mangrove areas to be influenced by the tide. If done improperly, large areas of the pond can turn stagnant, resulting in fewer areas for fish to thrive and no increase in tidal flushing to the mangrove area.

As part of the planning process discussed above,

Reminder

Pond modification involving significant earth movement is subject to the Environmental Impact Assessment System (EIAS) Law

the PO will already:

- Know the level of high and low tide at the dikes. If the dikes are already breached or if the water control structures are open, the PO should have a good idea of water depths inside the area.
- Know where the dike blocked former creeks, streams or channels.
- Know the location of mangrove areas blocked by the fishpond dikes.
- Know the relative locations and depths of holes and channels inside the pond.
- Most importantly, have a plan about how they wish to modify the pond.

This information answers these questions:

- Where will dikes be broken?
- How much height and how long a section of dike will have to be modified?

These answers represent the two key determinants in planning how much work will have to be done to modify the dikes. These in turn will help the PO avoid the problems that go with creating areas of stagnant

Remember

It is important not to create any areas of stagnant water when you break open the dikes. You will need to watch the pond for several weeks to make certain that this does not happen.

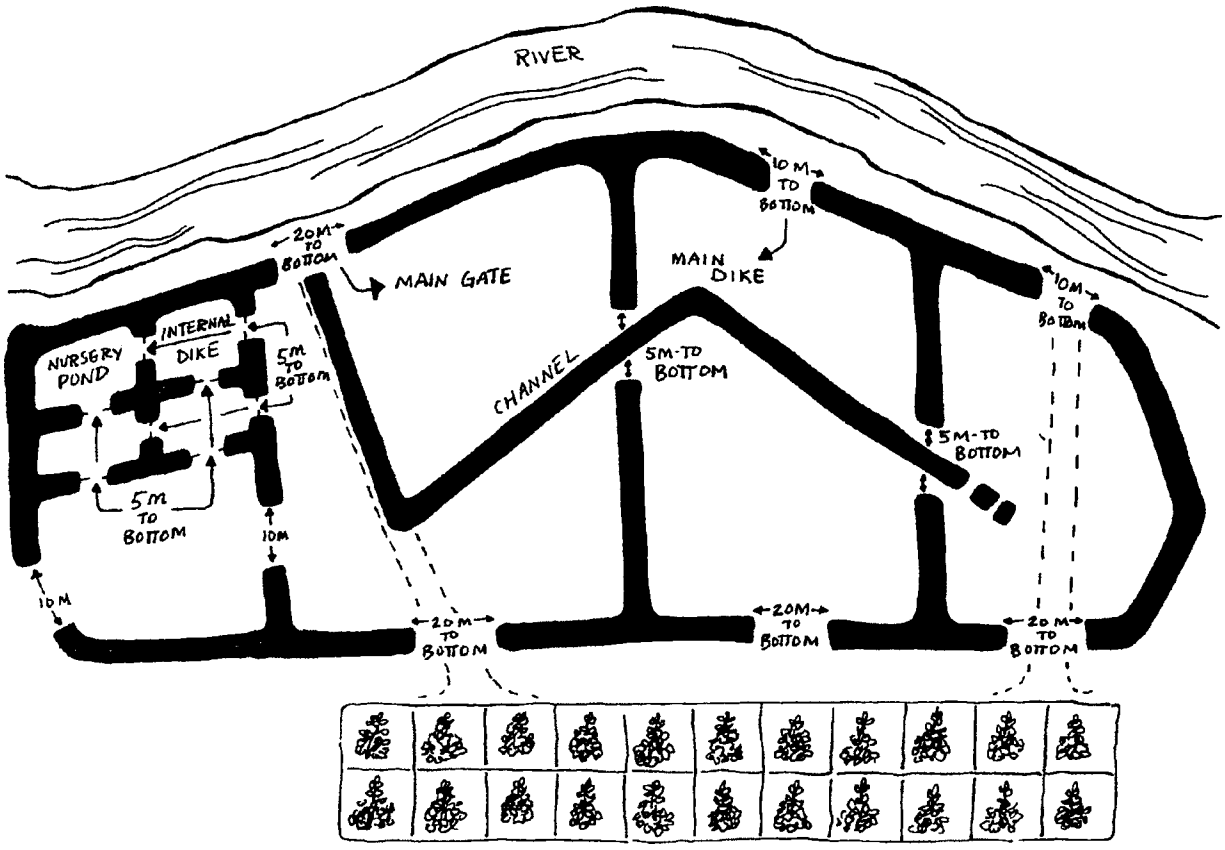

Figure 5.4. Sketch map of fishpond, complete with dike modification directions.

water in the pond. Figure 5.4 shows a sketch map that provides all the information needed for a crew to go about modifying dikes.

It is not necessary (at least in most cases) to excavate the entire dike area. In Figure 5.4, only about 150 linear meters of dike need to be excavated. Assuming there are 6.5 cubic meters of soil for every linear meter of dike, only 975 cubic meters of dike soil need to be dug to allow for adequate tidal flow.

In the above situation, a crew of eight men should be able to remove that amount of soil in approximately 25 days. The tools required include picks, shovels and mattocks (long spikes). While this is a significant amount of work, it is not necessary that it be done all at one time. It can be done over 1 or 2 months as time permits. There are a few "rules" that should be followed when preparing to dig and when digging.

What Do We Do With All of This Soil?

The soil that is excavated out of the pond and its dikes can be a valuable resource. The PO can use it to change the pond elevation in other areas to make it shallower and therefore easier to plant.

Modifying the Pond Floor

The bottoms of fishponds are seldom smooth and featureless. They often have channels left over from old streams, canals engineered for water control purposes and deeper and shallower parts because of the original pond topography. It is generally unnecessary to modify these features if all the PO wishes to do is create a mangrove plantation.

However, in cases where mangrove-friendly aquaculture is desired, it is often necessary to perform some level of modification. There are cases where the pond bottom is so deep or shallow that it is virtually impossible to modify to the extent needed for successful mangrove-friendly aquaculture. In these cases, the PO should content itself with a plantation only.

As detailed below, mangrove-friendly aquaculture does not require extensive modification of the pond bottom; the intent is not to perform full-scale aquaculture but to provide havens for fish and other organisms. Figure 5.5 shows a completed sketch map indicating where the dikes should be breached and where the pond bottom should be excavated and filled in. The soil should be placed at the back (landward) edge of the pond. This will help to modify the average depth in this area and allow a different species of tree to be planted.

Since full-scale aquaculture is not allowed, the PO should take full advantage of the unevenness of the pond bottom and such features as old stream beds and water control canals when designing their deeper areas. This may involve:

Rules for Excavating Dikes

During Planning

- ***It is crucial to ask your DENR and BFAR extension agents to evaluate your plans.***
- ***Make certain to excavate on either side of any gates. This will lessen the amount of digging you need to do. (Note: if you intend to keep the gates operational do not excavate in this manner.)***
- ***Make certain that you have approximately the same length of excavation on the landward and seaward sides of the ponds.***
- ***Whenever possible, stagger the openings so that the landward and seaward openings do not directly face each other.***
- ***Whenever possible, try to reopen creeks or streams that passed through the pond.***

During Implementation

- ***Excavate from the top of the dike to the bottom.***
- ***Place the soil along the inside margin of the dike to help form a shelf for future planting area.***
- ***Alternatively, if you know that there are low points in the pond, stockpile the soil and move it to the low points to fill them.***

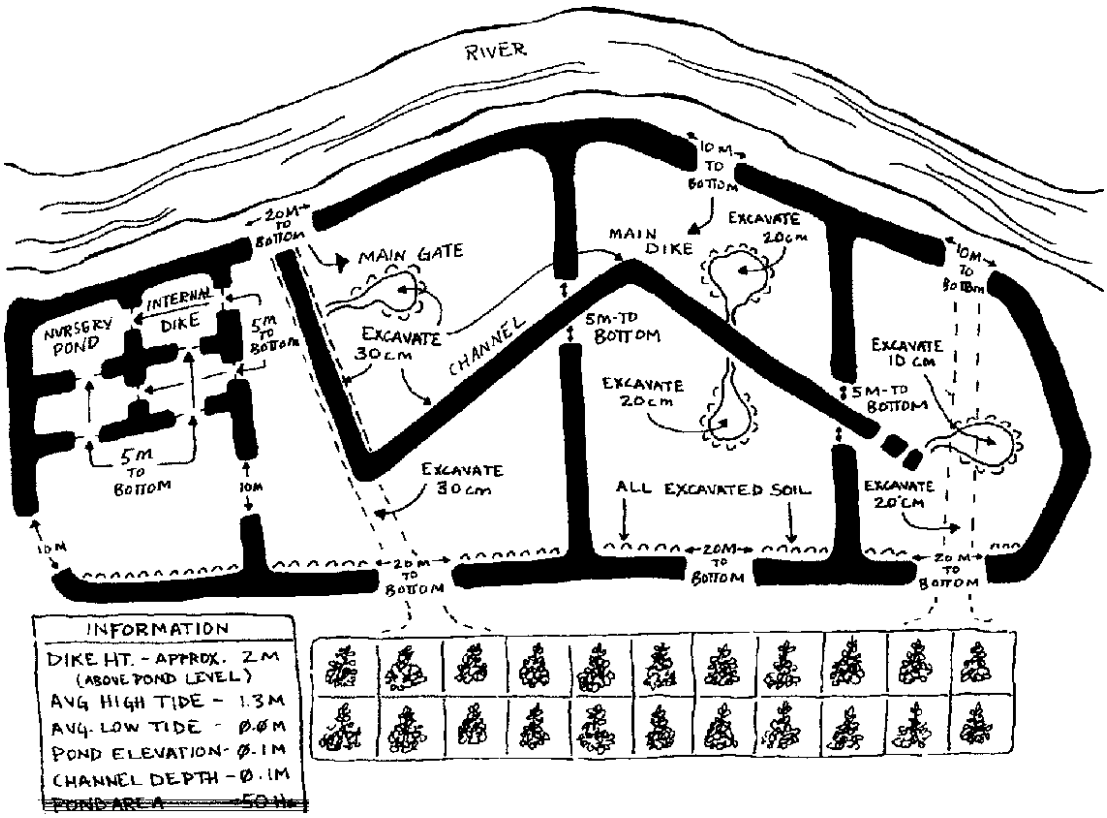

Figure 5.5. Sketch map as shown in Figure 5.4, but with further information.

- Deepening water control canals or former stream beds
- Deepening and widening depressions into holes that are several meters in diameter
- Excavating small feeder canals to parts of the pond to extend water flow

Take an area of approximately 1.5 hectares, for example, with an average excavation depth of 20 centimeters. This means 3,000 cubic meters of soil will be excavated. Place the soil at strategic points around the pond to change the elevations as desired. Moving this much soil will take an 8-man crew about 75 workdays. However, as in the case of the dikes, this task can be spread out over a long period of time, even a year or more. As parts of the area are excavated, they can be used immediately for mangrove-friendly aquaculture.

Hint

The excavated soil can be used to modify areas that are judged to be too deep to support planting or to change the relative depth of the water to allow another species to be planted.

MANGROVE-FRIENDLY AQUACULTURE AS MANAGEMENT OPTION

Mangrove-friendly aquaculture (MFA) or aquasilviculture/silvofishery is the raising of mudcrab/ shrimp within or under the mangroves. It can be a good

management option when fishponds in CBFMA areas are already restored. In the Philippines, MFA is relatively new; two types appear promising:

Mudcrab Fattening

Mudcrab fattening involves the collection of adult crabs that are large enough to sell in the market. However, the crabs demand a much higher price per kilogram if they are held for several weeks and fed until the crabs become "fat". When well fed, a crab will have much more meat and will have fat-rich deposits that are in big demand. Thin crabs of 100-170 grams can be fattened to 250-350 grams in 15-20 days if fed 2-3 times/day with trash fish equivalent to 5% of their body weight. The challenge is to find ways that the crabs can be maintained, fed and harvested. Pilot projects using plastic mesh cages are underway but the cost may prove prohibitive. Other approaches, perhaps without cages, might be more profitable. Finding suitable food for the crabs can also be difficult.

Mudcrab Pen Culture

The second approach to crab aquasilviculture involves buying small, young crabs and placing them in a pond/canal or on a central platform where they are allowed to grow for months until they are big enough to be harvested and sold. (Stocking density is 3 crabs per square meter for 70-gram crabs.) A study in Indonesia by Fitzgerald (1997) shows a layout of a pond (see Figures 5.6 and 5.7). The trials have a stocking density of juvenile crab (7-11 or 16-20 grams), 1.5 per square meter for the pond grow-out culture and 2.0 per square meter for pen culture, with males and females grown separately (SEAFDEC, n.d.). Another recommendation includes 3 clays, soil, water temperature of 23-32°C, 15-30 ppt salinity, a minimum of 4 ppm dissolved oxygen, pH of 8 to 8.5 and water depth of 80-100 centimeters or more.

Mudcrab culture is becoming popular in Bohol where big mangrove areas with sufficient freshwater input are available. The CRMP has started a 3-day training on mudcrab culture to CBFMA holders to augment the income of the POs and be able to concentrate on forest production activities.

The central platform is planted in *bakauan babae* (*Rhizophora mucronata*) at a spacing of 0.5 meter; one crab pen is located on the platform and one in the bottom of the canal. The PO can also raise shrimp and fish from natural stocking that enters with the tides. In Kalibo, Aklan, the Southeast Asian Fisheries Development Center (SEAFDEC) has also proven the viability of mudcrab pen culture with a 10 x 20-meter enclosure (bamboo and nets) in a 6-year old *bakauan* plantation. But mudcrab culture is a new technology; the PO should be very cautious before adopting it. Talk with the BFAR extension agent and find places to do cross-visits before investing any significant amount of time and effort in this approach.

As we have tried to indicate throughout this chapter, aquasilviculture is a new technique in the Philippines (and elsewhere in the world). While it holds promise, no PO should "put all its eggs in one basket" and go full-scale in adopting the techniques described here. A low intensity approach is best.

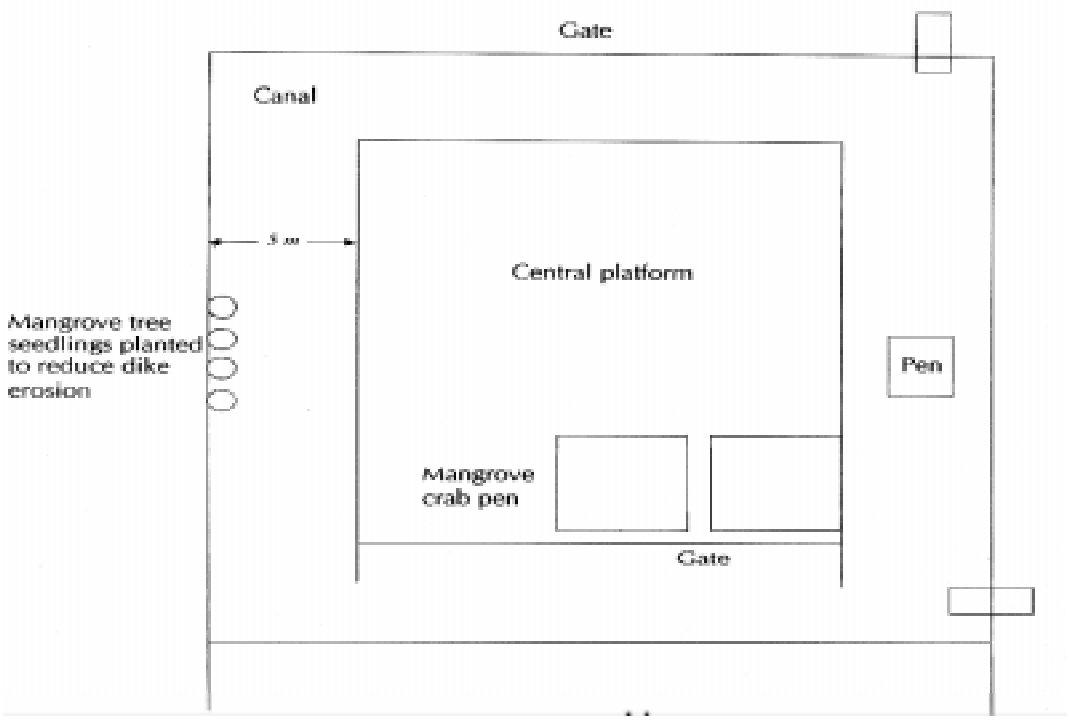

Figure 5.6. Empang Parit pond layout in Sinjai.
(Source: Fitzgerald 1997)

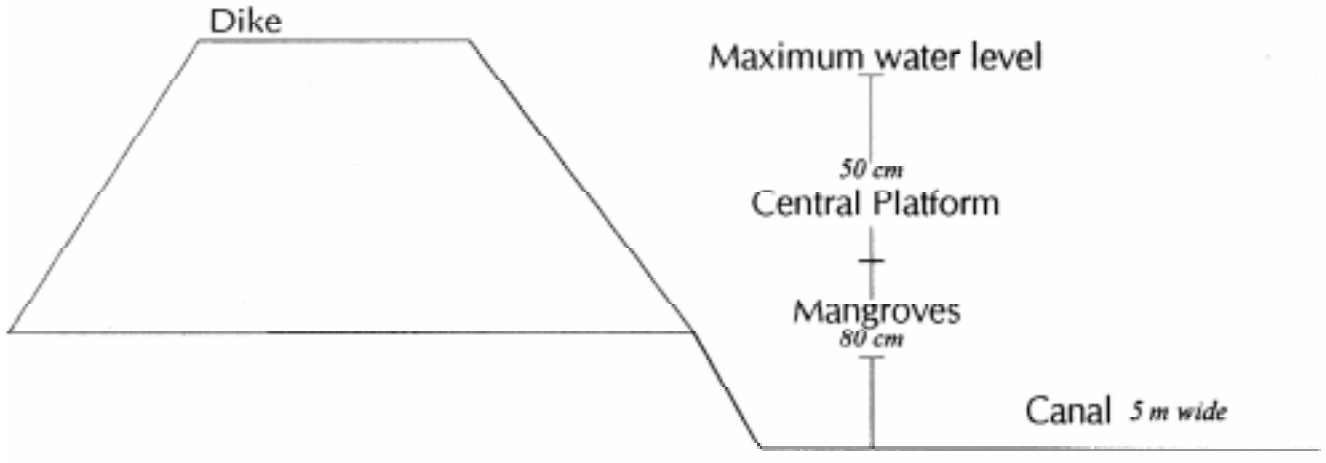

Figure 5.7. Cross section of Empang Parit pond at Sinjai.

(Source: Fitzgerald 1997)