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FACT SHEET

Designing a semi-intensive pond farming complex

Before embarking upon any aquaculture project, it is essential to construct a comprehensive business plan and to carefully consider all aspects of site location, farm layout and pond design. The precise set-up and management of any operation will be specific to the site and to the resources, vision and needs of each individual operator. However there are certain general principles that can help maximise design efficiency.

Some considerations

Blocking

When building a pond complex there are definite advantages to building ponds in blocks.

- Construction costs will be significantly reduced by ponds sharing common walls.
- Land will be more efficiently utilised.
- The costs of associated infrastructure such as piping, aeration and netting will be reduced.
- Ponds that are close together can be managed more efficiently and effectively.

Sump

It is essential that the bottoms of all ponds slope towards a well-defined low point, or sump, so that when ponds are drained crayfish and fish will follow the receding water and gather in the sump. Periodic draining of ponds is essential for both stock management and pond hygiene purposes.

Pond dimensions

There is no magic formula for determining the optimum dimensions of a pond. The pond must be of a size that is appropriate for specific site, management practices and labour requirements. Crayfish tend to avoid a featureless flat pond bottom and appear to benefit from close association with pond banks. Therefore long narrow ponds appear to be more productive than square or round ones. In recent years the industry has favoured relatively small rectangular grow-out ponds with approximate dimensions of 20 by 50 metres. Depth is very much dependant upon climate and water availability with ponds usually being from 1 to 2 metres deep.

Pond profile

In addition to having a sump it is also advantageous for a pond to have definite shallow and deep ends and a distinct “V” shaped cross profile (Fig 1).

If the site has problems with wading birds or filamentous algae then, in order to reduce the area of very shallow water, the pond shoulder should slope steeply until a depth of 350 mm before tapering off to a more gradual gradient. As crayfish cannot select depth in the water column the slope on such ponds allows them to reside at an appropriate depth to suit climatic and water quality conditions. Organic wastes and sludge will gravitate down the walls of the pond so as to accumulate in the central channel. This results in the majority of the pond bottom remaining

relatively clean and unpolluted and, after draining, allows the wastes to be readily removed from the central channel. For crayfish during pond draining, crayfish will readily vacate all habitats (hides) along the margins of the pond and proceed into the sump. Additionally, in a pond of this shape, a simple but effective circulation of water can be established through using air lift pumps to draw bottom water from the central channel and move it towards the sides of the ponds (Fig 2).

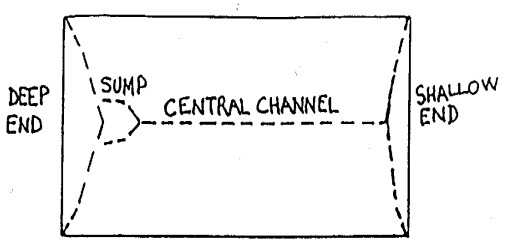

Fig 1: Pond with a "V" shaped cross profile (not to scale).

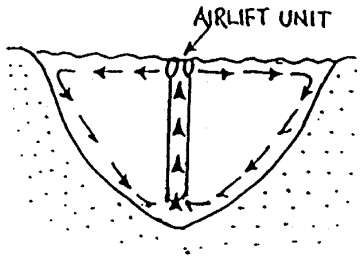

Fig 2: Cross profile of a pond showing airlift generated water circulation.

Drainage and Overflow systems

For security and convenience ponds should be capable of rapid (over-night) drainage and should incorporate an overflow system. In order to reduce construction costs many growers elect to utilise a portable pump rather than placing drainage pipes through the pond walls. With an appropriate pump and correct fittings, pond draining and filling can be a trouble free and inexpensive process. In order to cater for extreme rainfall events, all ponds should incorporate either a protruding overflow pipe (as in Fig 3, Example C), or a diversion channel.

When ponds are drained there are usually large numbers of crayfish and fish that must be harvested. Manually scooping the harvest from the sump is very labour intensive and can stress the crayfish. It is recommended that facility for a more efficient harvest process be incorporated into the pond design.

Another drainage option is to lay pipes through the pond wall so that gravity can be utilised for passive pond draining. Figure 3 shows three of the most commonly used methods, all of which can be used in conjunction with an external cage or sock to readily facilitate harvesting.

Example A

- Overflow water comes from the top of the pond, though if the pond is frequently in a state of overflow it is advantageous to place a sleeve (broken outline in diagram) over the standpipe so that the poorer quality bottom water is exchanged.
- Pond is drained by either pivoting the standpipe, or removing it from the joint.
- The standpipe is in the water which means that in order to adjust the water level a small platform must be built into the pond, or the grower must be prepared to get wet.

Example B

- Overflow water comes from the bottom of the pond.
- Pond is drained by removing cap.
- Standpipe and cap are outside the pond and are easily accessible.
- A removable filter, or short standpipe must be placed in side the pond to prevent stock from entering the pipe.

In Example A & B, the pond can be left to drain to a predetermined level by selecting an appropriate length of standpipe. Standpipes must always be secured to a stake to prevent accidental release.

Example C

- Overflow pipe protrudes into pond to prevent stock from entering.
- Pond is drained by opening cap.
- This method does not provide for the overflow discharge of bottom water or for the adjustment of water level.
- It is the simplest method and is particularly popular in low rainfall areas.

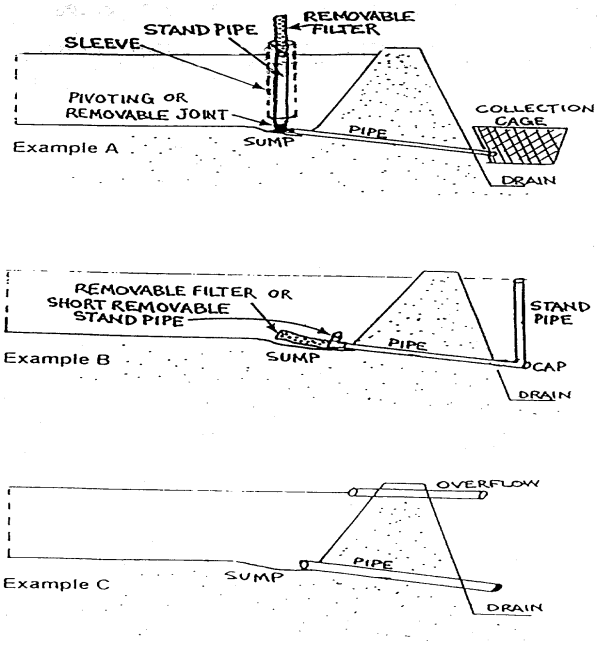

Fig 3: Examples of built-in drainage systems.

Positioning of the ponds

Ponds should be positioned in the same direction of the prevailing wind to ensure the maximum use of wind for aeration and water circulation (Fig 4).

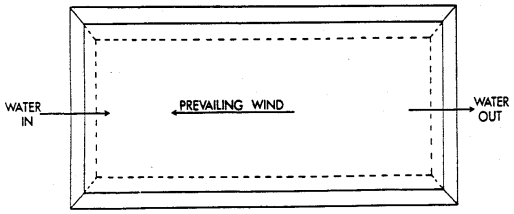

Fig 4: Position of ponds with respect to prevailing wind direction.

Utilisation of drainage water

Most semi-intensive pond systems will either gravity feed from a header pond, pump from a storage pond, pump from a bore, or utilise a combination of water sources. In all cases the ponds should be constructed so as to effectively utilise the available water resources. In most cases discharge water has been through a period of conditioning within the pond and is of a high quality. The drainage system should therefore be designed so that good water can be either directly returned into other production ponds or returned to the catchment pond. If a header pond is used, then discharge water should enter a storage or settlement pond so that it

can be recycled when required. In order to cater for emergency situations, all pond systems should have the ability to divert any poor quality discharge water into a settlement pond or directly to an irrigation system.

Throughout Australia the Environment Protection Authority (EPA) is becoming increasingly concerned with regulating aquacultural discharge water. For the sake of efficiency, as well as possible legislative reasons, it is now apparent that new farming operations should endeavour to achieve a status of zero discharge. When planning an operation it is also necessary to incorporate some provision for future expansion and for the project to be sustainable and environmentally friendly.

Further information

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