Freshwater Prawn Farming – Things to know for effective production

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ABSTRACT

Species of the freshwater prawn genus Macro brachium are distributed throughout the tropical and subtropical zones of the world. They are found in most inland freshwater areas including lakes, rivers, swamps, irrigation ditches, canals and ponds, as well as in estuarine areas. Most species require brackish water in the initial stages of their life cycle (and therefore they are found in water that is directly or indirectly connected with the sea) although some complete their cycle in inland saline and freshwater lakes. Some species prefer rivers containing clear water, while others are found in extremely turbid conditions. *M. rosenbergii* is an example of the latter. *M. rosenbergii* is now farmed in many countries; the major producers (>200 mt) are Bangladesh, Brazil, China, Ecuador, India, Malaysia, Taiwan Province of China, and Thailand (FAO 2002). More than thirty other countries reported production of this species in the year 2000.

Preparation of pond:

A freshwater prawn farm is very similar to a freshwater fish farm. The most easily managed pond sizes range between 0.2 ha and 1.6 ha, with most farms having ponds around 0.2-0.6 ha. The average depth of water in freshwater prawn ponds in tropical areas should be about 0.9 m, with a minimum of 0.75 m and a maximum of 1.2 m. Deeper ponds (an average of 1.2-1.4 m) are used in colder areas to maintain more stable water temperatures. However, deeper ponds are difficult to manage.

On the other hand, the water in shallower ponds may become too hot for the prawns in the hot season and the water may be quite clear, exposing the prawns to greater predation. Shallow ponds also tend to support the growth of rooted aquatic plants and are not recommended.

The bottom of the pond must be smooth. There must be no projecting rocks or tree stumps in it; these would prevent efficient seining and damage nets. The pond bottom must slope gradually and smoothly from the water intake end towards the drain end so that, when drained, pockets of undrainable water in which prawns become stranded and die do not occur. A slope of 1:5 (0.2%) is suggested for ponds 0.4 ha or more in area and 1:2 (0.5%) for smaller ponds towards the outlet, where drain harvesting occurs.

Stocking

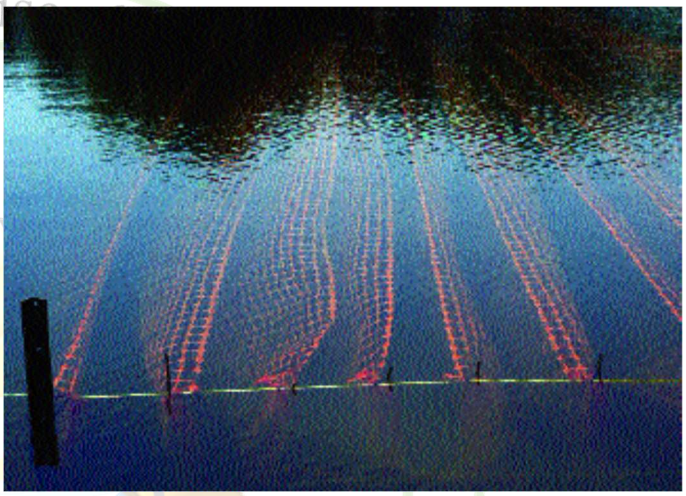
It is better to stock ponds immediately after filling them with filtered water. Stocking the ponds quickly reduces the amount of competitors and predators, which have less time to become established. Juveniles are more tolerant of high pH and ammonia than PL and there are some advantages in stocking juveniles instead of PL, even in tropical areas. On arrival at the pond bank you should take great care to acclimatize the PL to the temperature of the pond water by floating the transport bags in the pond for 15 minutes before emptying them into the water. Severe mortalities can be caused not

only by thermal shock but also by sudden changes in pH. Acclimatize the PL to this pH level slowly (over a one-day period) in the hatchery-nursery before transporting and stocking them at the grow-out site.

The stocking rate you need to use depends on the size of the animals you will eventually be selling, on the length of the growing season (determined by water availability and temperature), and on the management system you are using. Semi-intensive stocking rates vary between 4 and 20 PL/m2 (40000-200000/ha). The lower stocking rates will tend to result in prawns of a larger average size. Higher stocking rates tend to result in greater total productivity (mt/ha/crop) but smaller average prawn size.

Substrate Installation:

Another means of improving results in temperate freshwater prawn culture is to place artificial substrates in the ponds, which makes it feasible to increase stocking rates above the level recommended earlier for ponds without substrates. PVC fencing forms an ideal substrate. This material can be expensive in some countries but the investment should be worthwhile, as the following information indicates. Substrate provision on a commercial scale has resulted in production and mean harvest size exceeding 1800 kg/ha/crop and 35 g respectively, from a stocking rate of 4 PL/m^2, while yields exceeding 2 500 kg/ha/crop with average weights of >40 g have been consistently achieved at a stocking rate of 64500/ha (Tidwell and D'Abramo, 2000). It is therefore suggested that you increase the stocking rate of juveniles from the 4/m2 (40000/ha) recommended earlier for use without substrates to 6.5/m2 (65000/ha) when you use either horizontal or vertical substrates. This new technology is still being developed but it clear that the use of substrates can markedly increase the productivity of freshwater prawn farming.



Artificial substrate in the freshwater prawn pond

Feeding and fertilization

The feeds and feeding strategies given apply equally to prawns reared in nursery facilities. It is necessary to maintain an adequate phytoplankton density, to provide cover and control the growth of weeds in freshwater prawn ponds. This is done by encouraging the growth of phytoplankton. However, it is often unnecessary to fertilize, because this is rapidly achieved by the feeding regime. However, ponds built in a sandy-clay soil may require fertilization for this purpose. Where necessary, 25 kg/ha/month of triple superphosphate (Na3PO4) will keep the water green. Benthic fauna are very important features in the ecosystem of freshwater prawn ponds, forming part of the food chain for prawns. Fertilisation to encourage the development of benthic fauna is therefore recommended. Animal manures have been used for this purpose (e.g. 1 000-3 000 kg/ha of cattle manure).

Feed type

You can get a small production level of freshwater prawns (perhaps 200-300 kg/ha/year) by relying on the natural productivity of the ponds. However, successful semi-intensive farming must involve supplementary feeding. Some farms claim to rely on fertilization, rather than feeding, at the beginning of the rearing period. Some stimulate an initial algal bloom through the addition of an inorganic fertilizer (9 kg/ha of phosphorus). Others find that providing feed from the beginning of the rearing period improves performance and is cost effective. However, the dividing line between the effectiveness of feed as a direct nutritional input to the prawns and what is acting as a fertilizer is blurred. Whether the feeds are pelleted mixtures or individual ingredients (such as distillery or brewery by-products), they actually act as both feeds and fertilizers. At the beginning their primary use may be as an organic fertilizer that enhances the availability of natural feeds in the rearing ponds. Later, as the prawns grow, the feeds become more and more directly consumed by the prawns. The application of feeds/fertilizers from the beginning of the rearing period not only increases the availability of natural food but also decreases the transparency of the water, therefore reducing the growth of weeds.

The types of feed used in freshwater prawn farming vary widely and include individual animal or vegetable raw materials and feed mixtures prepared at the pond bank; both of these are generally referred to as 'farm-made feeds'. In addition, commercial feeds designed for freshwater prawns are available in some countries, sometimes from several aquafeed manufacturers.

Commercial feeds for freshwater prawns tend to use ingredients which are available in large quantities; any of them are global commodities, such as fish meal or soybean meal. You can also include some of these ingredients in the feeds you make on-farm. In addition, you could include so-called 'unconventional feeds' (feeds not normally used in commercial feeds because they are only available in small quantities, often only locally and seasonally). In addition to 'trash' fish, molluscs and prawn wastes form valuable animal protein sources. Meal made from the leaves of the Ipil ipil bush (*Leucaena* sp.) has formed a constituent of shrimp and prawn diets but its use is cautioned by the toxicity of mimosine, which is a problem in its use for terrestrial animals. Some farmers add other materials to their ponds, including pig manure (added as a feed, not a fertilizer, where ethnically acceptable) and the mortalities from chicken farms, staked out around the periphery of the pond. Other locally available materials may also be satisfactory. If you use individual raw materials (not made into a mixed and bound compound feed), especially wet materials (such as trash fish and beef liver), you stand more risk of causing your pond water to become polluted. Compounded feeds, especially when they are water-stable, cause less problems of this type. Compounded chicken and pig feeds, either unmodified, or re-extruded through a mincer with trash fish or prawn meal, have been used in freshwater prawn farming. However, be careful about using chicken and pig feeds because they often contain growth promoters, antibiotics, and other substances which may have unpredictable effects on prawns. Their presence in prawn tissues may also make the product unacceptable.

Aeration

Most prawn farms use water exchange to keep dissolved oxygen levels high, as well as curing other water quality problems. It was also noted that permanent aeration equipment was not normally provided for many freshwater prawn grow-out ponds but that equipment for emergency aeration was useful in times of oxygen depletion. However, since that time, aeration has become more common place in freshwater prawn farming because the higher stocking densities that are used in some grow-out systems and nurseries increase oxygen demand.

Paddlewheels are the most efficient method of increasing dissolved oxygen levels in pond water. Recently, long shaft engine-run paddlewheel aerators have been developed, which can be operated in remote areas far from power supplies. Aerators are needed to ensure the water quality necessary for increased productivity (for which maximum growth and survival rates are required) and emergency use, especially after partial harvesting.

Management of the grow-out phase

Size variation

The management of size variation is an extremely important aspect of growing freshwater prawns, because of the uneven growth rate of individual prawns, especially males, known as HIG.

Preparing your pond

Check all inlet and outlet screens. Completely dry the pond for 2-3 weeks. The sediment consists of particles contained in the incoming water, the effects of erosion, the remains of dead pond organisms, prawn faeces, remnants of feed, and exoskeletons cast during prawn moulting. One of the effects of a heavy sediment build-up is a decrease in the volume of water available for the stocked prawns to occupy. Scraping the bottom of the pond can be used to remove sediment, sediment elsewhere, it can be spread in a thin layer over the pond bank surfaces and allowed to dry until it cracks. You should till (harrow) the bottom of your ponds during the drying period to increase the oxygen content of the soil, especially if it has a heavy texture (clays and clay loams).

Where there has been a severe disease problem in the previous crop, you should spread 1 000 kg/ha of agricultural limestone ($CaCO_3$) or 1 500 kg/ha of hydrated lime [sometimes called slaked lime – $Ca(OH)_2$]. It is better if you use agricultural limestone. The use of slaked lime, or quick lime (CaO) may increase the subsequent pH of the water above tolerance limits if prawns are stocked (as is recommended for other reasons later) soon after the ponds are filled. After adding agricultural limestone, you should sun-dry the ponds for at least two weeks so that toxic gases such as hydrogen sulphide and methane are voided.

If your pond has previously been stocked with fish and you want to convert it to freshwater prawn culture, or if a lot of fish were present during your last prawn grow-out season, treat it with a piscicide after harvesting and while it still has water in it. Rotenone or teaseed cake are commonly used for eradicating unwanted fish between cycles. They are effective if spread evenly throughout the pond.

.If your water supply is very soft, you can increase its hardness by adding calcium sulphate (gypsum). If the pond water before draining shows levels lower than this, gypsum should be added during pond preparation. 2 mg/L of gypsum is required to increase total hardness by 1 mg/L. Thus, if the total hardness is 20 mg/L before treatment, 600 kg of gypsum/ha (for ponds with an average water depth of 1 m) should be applied to correct it to 50 mg/L.

Some farms use organic fertilisation, Manure is used for fertilising ponds, before and during the rearing cycle. , freshwater prawn ponds are often fertilized between cycles using 1 000-3 000 kg/ha of cattle manure or other organic material. This increases the benthic fauna, which become an important feed for PL and juveniles.

Harvesting prawns

Basically, there are two methods of harvesting: culling (sometimes called cull-harvesting) and draining (drain-harvesting). The time to harvest depends partly on growth rate and the size of animals you want to sell. This, in turn, depends on your market requirements. It also depends on the pond management technique chosen. Cull-harvesting is used to harvest market-sized animals from the pond at intervals and removes the faster growing prawns. The rest of the prawns are caught when the ponds are

drained at the end of the grow-out cycle. In tropical ponds cull-harvesting usually starts 5-7 months after PL have been stocked, or sooner if juveniles have been stocked. After cull-harvesting commences, you should totally seine each pond once per month or partially seine it twice per month (i.e., seine half the pond twice per month or all of it once per month). Take out the market-sized animals and sell them. Keep the smaller ones and soft-shelled animals in the pond for further growth. After about 8-11 months, drain the pond and sell the whole harvest. After drain-harvesting, you can either prepare, refill and restock the pond immediately, or keep it empty until you have enough water available again and/or (in temperate zones) until water temperatures become suitable again for rearing.

Cull-harvesting is not very efficient in removing harvest-sized prawns. It does not maximize the total quantity of marketable prawns which could be achieved, partly because some marketable animals remain in the pond longer than necessary and partly because the smaller prawns do not get the maximum chance to grow faster than they would have if there were no dominant prawns left behind. In theory, the best management system would be to totally harvest the pond, remove all the dominant animals, and restock the others in the same or a different pond.

You should carry out all harvesting operations as early as possible in the morning when it is cooler, to avoid having water levels too low when the sun is directly overhead. If you allow the water to become shallow, temperatures can quickly rise to danger level and the prawns will be subjected to low dissolved oxygen levels. This will cause many mortalities before you can finish harvesting all the animals.

Miscellaneous

In addition to its ponds and its water distribution systems a freshwater prawn farm has the following equipment and facility requirements: power; roads and access paths; accommodation: every farm should have accommodation for some of its workers to live on site; fencing: a perimeter fence and, on larger farms, lighting, to deter poachers (human predation); storage facilities: dry storage is needed for feeds (or ingredients), chemicals, nets, etc.; feed distribution and monitoring equipment; nets; water quality monitoring equipment; predator protection; and transport: larger farms will need trucks for prawn distribution and feed collection.