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Culture of FRESHWATER PRAWN (*Macrobrachium rosenbergii*) in EARTHEN PONDS

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INTRODUCTION

Macrobrachium rosenbergii is an indigenous specie in the Philippines. It is known locally as *ulang, udang, kising-kising* and *pahe.* There are about 15 species reported to be present in the country. The study on its geographical distribution in the Philippines is still being undertaken.

There are more than 100 *Macrobrachium spp* around the world. Three are reported to be used for aquaculture like *M. americanum, M.carcinus* and *M. rosenbergii.* The most popular specie for culture is *M. rosenbergii* because of its impressive growth performance and ability to survive and grow in turbid water conditions.

In the Philippines, freshwater prawn is an important species to be able to diversify products from freshwater aquaculture. The focus of aquaculture on a single specie, like tilapia, causes oversupply and depressed market price. The culture of *Macrobrachium rosenbergii* will offer an alternative high-value species with wide market acceptability both local and foreign.

ECONOMICS*

Fixed Cost

Land cost	Php 200,000.00
Construction cost (Earthmoving)	200,000.00
Water inlet and outlet	20,000.00
Water pump (diesel 16 hp)	45,000.00
Seine net	15,000.00
Hapa	5,000.00
Tubs	3,000.00
	Php 488,000.00

Production Cost

Post-larvae (50,000 @ Php 1.00/PL)	50,000.00
Fertilizer (basal fertilization)	
Chicken manure (82 bags @ Php 30/bg)	2,460.00
16-20-0 (2 bags @ Php 420/bg)	840.00
Feeds (256 bgs @ Php 430/bg)	110,080.00
Fabricated shelters	1,000.00
Gas (Php 500/mo)	3,000.00
Labor (Php 3000/mo)	16,000.00
Depreciation	23,766.70
	207,146.70

Production

3,200 kgs (50,000 less 10% mortality = 40,000 80 g each @ Php 250/k)	800,000.00

Calculation of Benefits

Gross Sale	800,000.00
Less : Production Cost.....	207,146.70
Net Profit	592,853.30
Return of Investment	85.28%
Payback Period (Years).....	1.09

*Based on a 1 ha new earthen ponds and 6 months culture period

of culture. A seine net with a mesh size of 12 is fabricated. The net is provided with lead sinkers and floaters and a catch bag with a dimension 2 x 2 x 0.5 m deep located at the mid-portion of the net. Seine by pulling both ends of the net towards the deepest corner of the pond. It is preferable to seine in the morning. Harvesting must be timed according to the dictate of the market.

Flood-in additional water after the initial harvest to help the remaining stocks recover from shock and stress. Resume the feeding in the late afternoon. Continue the twice-a-day feeding. Change part of the pond water when necessary. Complete the harvesting after one or two months. Totally harvest the pond by draining early in the morning. Collect the prawns in the puddles using smaller nets or by hand-picking. If tanks or large portable containers are available, fill with water and use for holding the harvest. Use flowing water to clean and aerate the prawn prior to delivery to market.

Total harvesting

When market is assured, total harvest can be the best option in harvesting *ulang*. Thin the stocks by seining the pond twice or thrice. Afterwards, total drain the pond. After collecting the grown stocks, wash and place them in large containers. Grade the prawn according to sizes, i.e. small, medium and large. The size groups will have different market price. Always provide covers on the containers when transporting the table-size *ulang*.

POND CONSTRUCTION AND PREPARATION

Site Selection and Engineering

The proper selection of sites with consideration on soil and water quality and knowledge of appropriate designs are vital to economize cost of pond construction and maximize the production of an *ulang* project.

Soil

The soil quality is an important consideration in selecting a site for the culture of freshwater prawn. Soil with high percentage of clay is ideal because they can hold water longer, thus pumping becomes less expensive. Likewise, construction and maintenance of dikes is easier with this type of soil.

Areas with less ideal soil quality can also be used provided regular and sufficient supply of water is ensured. However, this condition may have adverse effect to the economics of culture.

Water

An important area of concern is the quantity and quality of water. There are many sources of water for the culture of *ulang* such as surface waters like communal irrigation canals, rivers, and creeks; and underground or shallow wells. The quantity of water from open sources is plentiful and usually economical to use. However, these are also the sources of unwanted and usually destructive fish species, such as mudfish, catfish, goby and wild tilapia. The use of screen devices is necessary to prevent entry of such species and to prevent the prawn from being consumed by predatory species during moulting.

In coastal areas, *Macrobrachium rosenbergii* can also be cultured in slightly saline environment. They can grow very well in 5 to 8 ppt. At higher salinity, growth is observed to be slower.

Reports indicated that the growth rate of *ulang* is lower in hard water. A hardness level of less than 150 ppm is preferable. Growth and survival are also influenced by temperature. The optimum temperature ranges from 29 to 31 C. Temperature below 14 C or above 35 C is usually lethal to freshwater prawn.

Design

Relative to feeding management, the best shape of an earthen pond for *ulang* is rectangle as this shape provides ample shoreline area for feeding. Monitoring and harvesting of stocks are easier if the pond is rectangular.

The water depth of the pond can be from 0.5 to 1.0 m. In constructing the dikes, enough allowance for shrinkage and freeboard of about 30% must be provided. Likewise, steep dikes are desired to prevent the prawn from escaping.

The bottom of the pond must provide a gentle slope towards a catching area. When water from open sources is used, screen or filter devices must be provided to prevent entry of unwanted species. An outlet or spillway will prevent overflow during heavy rains. Harvesting is convenient if an outlet gate is provided in the design.

From experience, the comfortable commercial size for a pond is 1500 to 2000 sq m. Smaller ponds can also be used.

Pond Preparation

Pond preparation is a very important factor in order to succeed in the project. Poorly prepared ponds are likely to encourage loss of stocks due to predatory animals, escape and low survival rate.

Draining (Old ponds)

Drain the pond and ensure that all fish are harvested or eradicated. Emphasis is given to carnivorous species such as mudfish , catfish , goby and tilapia. If such species are suspected

measures. If birds seem to be a bigger problem during culture, the use of devices to scare them might be appropriate.

With correct management practice and sufficient monitoring of feeding and growth, the economic viability of culturing *ulang* is ensured.

Harvesting

The growing period for freshwater prawns depends on the market-size preference. Farmers who are new in the industry may need to observe and study the sizes and corresponding prices of the commodity in the market. In areas where wild stocks abound like in the province of Bulacan, *ulang* with an average weight of 30 g are sold at Php 250.00 per kg. The price of freshwater prawn is higher when sold alive.

Field experiences suggest that a well-managed project can produce prawns at a size of more than 40 g in five months. In a no-feeding management scheme, *ulang* can be harvested at a size of 36 *ulang*/kg in a four-month culture period. Well-fed stocks even when grown in a static brackishwater pond can reach a size ranging from 90 to 100 grams after seven months.

Prawns will be unable to cope with or regain the lost growth when they fail to grow very well during the initial culture months due to poor management or insufficient feeding.

Fifty per cent survival rate is very common for the grow-out culture of freshwater prawns in earthen ponds. However, if all management procedures are followed, survival rates higher than 80 % are likely to be achieved.

Selective harvesting

When a specific size is required, it is best to opt for a selective harvesting scheme. This is done after five to six months

Water Management and Control of Vegetation

The water depth of the pond must be maintained at the highest possible level. The growth of *ulang* is greater in deep water. Deep water discourages the luxuriant growth of pond weeds and therefore minimize labor cost. When the water is shallow, the prawns love to stay near shore and are prone to be predated by terrestrial animals like birds. Keeping the water deep at all times is therefore beneficial for the success of the project.

Changing part of the water is encouraged when, after a long period of continuous feeding, the water becomes brownish and suspected to have low dissolved oxygen at night. This maybe true when the prawns are stocked at high density. Low DO is suspected if the animals begin to crawl out of the pond and congregate near the banks in daylight. Frequent changing of water will not only flush out excess feeds and other organic substances but will also induce the moulting of the post-larvae.

Regular cleaning of the dikes is important to minimize lost of stocks due to preying by terrestrial animals. Dikes with thick vegetation are attractive to birds, snakes, frogs, lizards and livestocks such as ducks and chicken. Fish predators such as mudfish and catfish can migrate over weedy dikes during cool and misty nights.

Monitoring

Monitoring of stocks is an important activity to check the growth and over-all status of *ulang* in the pond. This must be done regularly at least twice a week.

To monitor , let in some water to attract and converge *ulang* near the moving water. At night and aided by a flashlight, look and observe the prawns near the flowing water or around the periphery of the pond. They are easy to spot because their eyes glow in the dark when hit by a flashlight.

The activity will also check on nocturnal birds and other animals which can prey on the prawns. Early detection of the problem will allow the farmer to immediately institute corrective

to have burrowed into the mud or pockets of water, apply 4000 kg of fresh chicken manure to suffocate and kill all the fish. The manure applied also serves as basal fertilization to promote the growth of primary natural food in the pond. Sundry the bottom of the pond. The pond is ready for flooding when a person can already walk on top of the pond bottom without sinking.

To eradicate unwanted species, use legally sold pesticides such as Lorsban and Decis. When mixed, the solution is found to be very potent against various species of fish and shrimps. Check the pond water three days to one week after the first application of pesticide. Repeat the procedure if mosquito fish are still present and too numerous since these livebearers are able to maintain their youngs inside the stomach and later lay the fry even when the mother is dead. Small and bony carp specie called *talandi* has higher tolerance to pesticides. In such a case, Bayluscide can be used. Change the water of the pond three days after the application.

Clearing and Repair of Dikes

Regularly clear the dikes of weeds and other vegetation to discourage its use as harbor of predators such as birds, snakes, lizards and frogs. Check for and patch-up leaks.

Water inlet and outlet gates must be provided with new screening devices to prevent entry of predators and escape of stocks during rainy months. During the course of culture, provide adequate maintenance to these important fishpond facilities.

Fabrication and Installation of Shelters

Shelters are fabricated from bamboo or tamarind twigs. The twigs which are about one meter long are bound together (waist-size) by GI wire or plastic cord. Sufficient weights like stones or metals are provided to keep them submerged and stay fixed in

the water. Stakes can also be used. The shelters are distributed in the pond especially in areas where the prawns are likely to stay. At an early stage (post-larvae to juvenile), the organisms love to cling on anything.

Shelters are necessary to provide refuge and hiding place for *ulang* when moulting. When shelters are absent, they are easily preyed upon when they are sluggish and escape from predators is almost impossible.

Flooding

Flood the pond to a maximum level after distributing and fastening the shelters. Make sure that unwanted species are screened out during the filling of water. Maintain the water level between 0.5 to 1.0 m or deeper.

Installation of Hapa Net

Install a 2 x 2 x 1 m hapa net one day prior to stocking of prawn post-larvae. Situate the hapa net near the water inlet or at the deepest part of the pond. Consideration must be given to the comfort of feeding the stocks. Fasten the net at wooden or bamboo stakes driven to the pond bottom. Place weights (stones) inside the net to sink the bottom part. Place two to four coconut fronds inside the hapa to serve as shade and surface of attachment for the post-larvae.

One unit of hapa can accommodate 2000 post-larvae. Survival rate is higher when the stocking density per hapa is lower.

CULTURE MANAGEMENT

To prepare for stocking, contact the source of post-larvae at least one week prior to purchase or transport of seeds. It is best to count the post-larvae two days prior to hauling to lessen or avoid mortality.

Fertilization

Fertilization is an essential management procedure that promotes the production of natural food for *ulang* in earthen ponds. The nutrients from the organic and inorganic fertilizers promote the growth of phyto- and zooplanktons which are the primary food of post-larvae in the pond. The luxuriant growth of planktons will not only provide a widely-distributed food supply for seemingly immobile species like *ulang* , but can also serve as cover against predators to prevent cannibalism during moulting.

Fertilization, as a sole supplier of food, is limited for prawn stocked at low densities. At densities higher than 10,000 PL / ha, the natural productivity of the pond is so limited and must be supplemented by artificial feeds. As the stocking density approaches the high end of 50,000/ha, the contribution of fertilization as a source of food ceases and culture must depend solely on artificial feeding.

If at the onset or early growing months of *ulang* the amount of food given is insufficient, the growth performance of the animal will significantly decline. Any attempt to recover from the loss will be futile even if greater amount of food is given in the latter part of culture. The condition of retardation cannot be reversed.

Kinds of Fertilizer

a. ***Inorganic fertilizers***

This group includes urea and 16-20-0. Application techniques include broadcasting for basal application (100 kg / ha) and hanging during regular and subsequent fertilization (25 kg/ha/ week).

b. ***Organic fertilizers***

The most common commercial organic fertilizer is chicken manure. Application rate is 82 bags (38 kg) per ha for the basal fertilization. Side-dressing or regular fertilization is done at a rate of 20 bags /ha/wk. The manure is applied by broadcasting.

Regular application of fertilizers will sustain the productivity level of the pond given a specific culture period.

crustaceans; and, animal and vegetable organic materials. They are also cannibalistic especially when moulting. They can also feed on cassava, trash fish, kitchen refuse like cooked chicken, pig and fish entrails, and any terrestrial animal or fish commercial diets.

Ulang is a nocturnal animal. They are very active and feed very well at night. In ponds, they feed in shallow areas near the dike.

Feeding Techniques

There are two ways of feeding *Ulang* in ponds.

a. ***Fertilization plus supplemental feeding***

In low density stocking, the initial food is produced by pond fertilization. By fertilizing the pond, natural food is produced. Its availability can be sustained by regular application of both organic and inorganic fertilizers. Supplemental feeding begins after 60 days of culture. The supplemental feeds can be a mixture of different ingredients done by the farmer which may include ipil-ipil leaves (*Leucaena sp.*), or any commercial terrestrial or aquatic animal feeds.

b. ***Commercial diet***

The use of commercial diet is recommended when the culture level is high. Feeds are given *ad libitum* two to three times daily. More feeds may be given in the afternoon ration since *ulang* are nocturnal animals and very active at night. Feeds are distributed along the shallow and clean portions near the dikes of the ponds. Assigned feeding areas are distanced one meter apart. Adjustment of feeding rates depends on the ability of the animal to consume what is given them. If, in the morning, all feeds in the feeding areas are well consumed, the quantity of feeds is increased. However, if there are leftovers, the quantity of feeds is lessened in the next feeding. The daily feeding rate can start at a quantity of 6.25 kg / ha / day and may gradually build-up up to about 37.5 kg/ha/day during the course of the culture.

Stocking Density

The stocking density for the culture of *Macrobrachium rosenbergii* in earthen ponds ranges from 20,000 to 50,000 per hectare. The factors limiting the density are the state of the facility (depth of water, regular availability of water, and presence of life support systems like aerators), market size desired for the prawn, and the economic capacity of the farmer to finance the project.

Post-Larvae

Post-larvae is the stage when the shrimp begin to swim head first, tail down and dorsal side up. Many crawl or cling to tank surfaces. Normally, this stage is reached 16 to 28 days from egg stage. Development is shortened when water temperature is warmer and when food is given adequately. Post-larvae 18 (PL 18) is the term used to describe the stage when the organism exhibited the behavior of a post-larvae for 18 days. This is the stage where the seeds are found to be strong against stress such as counting and transporting. It is best to buy older or bigger seeds when available, however, it is not advisable to mix different age-groups in a pond.

Counting

Count the seeds in a shaded area or very early in the morning. Drain the larval rearing tank and concentrate the post-larvae in the catch basin. Gently scoop them out and place in an aerated plastic basin. Using a small white bowl or cup, count the seeds individually. Avoid mixing sizes. Do not crowd the seeds during counting. Accuracy must be weighed against losses or mortality of post-larvae due to excessive handling. However, counting must be fairly accurate to be the basis of correct stocking density and feeding rate.

Re-stock the counted seeds in a well-aerated tank at a density of 5000 PL/ sq m. They can be retained in such density for a week with water exchange of 200 per cent. Feed well to

discourage cannibalism among the PL. Upon stocking, moulting is likely to occur and cannibalism is expected to be a problem. Cease feeding one day prior to transport.

Packing and Transport

Plastic bag measuring 50 x 76 cm with a thickness of .003 is used in the packing and transport of PL 18. To ensure against accidental bursting, the bag is doubled. Tie with a rubber band the two lower corners of the bag to round off corners or remove dead spots where PL can be trapped and die. Then fill the bag with about 8 liters of freshwater preferably from the holding tank. If new water is used, moulting is likely to occur during transport and can result to cannibalism. If the pond to be stocked is brackishwater, proper notice is given to the hatchery so that seeds being bought are acclimated to the desired salinity. Inflate the bag with medical oxygen and seal tightly with rubber bands.

For long transports, the density per bag is 500 PL. For short distance trips, 1000 PL can be contained in a bag. It is best to place the plastic bag in a box or pandan bag. The seeds are less active in the dark and bags are better protected. For air transport, the use of styropor boxes is required. It is wise to place two fist size of ice wrapped in newspapers inside the box. Enough space is provided in the bag during oxygenation so that allowance is provided for any change in pressure during the plane trip. When the packing of PL is ideally prepared, the travel time can last to about 16 hours.

In cases where transport is estimated to be more than 16 hrs, the trip must be programmed to include the change of oxygen during the trip. For plane transport, the change of oxygen or repacking can be done before embarking or checking-in of baggages. The ice shall also be checked or replaced at this time.

Since the best stocking time is in the morning, the most appropriate transport time is during sunrise or night-time. During hot climatic conditions, the use of air-conditioned vehicles or the

use of ice as mentioned above is highly considered. Transporting in lower temperature is important to reduce the metabolic activity of the prawn during transport which is important for higher survival.

Release of Seeds in Hapas

Acclimatize the seeds in the transport bag to the temperature of the pond by placing the bags floating inside the hapa for about 15 minutes. Acclimation period is longer when ice was used during transport.

When the difference in temperature between the bag and the pond is less than 5°C, the seeds can be released. Open the bag and carefully let pond water mix with the water in the bag. Continue the process until the *ulang* start swim out of the bag. Only then that seeds are poured out of the bag to complete the stocking.

Feeding of post-larvae in the hapa is done five times a day. Commercial feeds with high protein content and with the right granule size is used. It might be desirable to pulverize the bigger feeds with mortar and pestle and sieve it with fine-meshed net.

Release of Seeds in the Pond

After a week in the hapa and observing normal feeding and other behaviors, lower a lip or three sides of the hapa under the water to allow the shrimp to escape into the vastness of the pond.

NUTRITION

In the feeding of *ulang,* two basic information must be understood - the behavior of the species and the most economical feeding management for freshwater prawn.

Feeding Behavior

Basically, *M. rosenbergii* are omnivorous. They can feed on anything like zooplankton, algae; small mollusks and