Southeast Asian Fisheries Development Center **Aquaculture Department**
SEAFDEC/AQD Institutional Repository **http://repository.seafdec.org.ph**

Journals/Magazines Aqua Farm News

1995

Traditional bangus culture

Aquaculture Department, Southeast Asian Fisheries Development Center

Southeast Asian Fisheries Development Center, Aquaculture Department (1995). Traditional bangus culture. Aqua Farm News, 13(6), 4-8, 15.

http://hdl.handle.net/10862/2489

Downloaded from http://repository.seafdec.org.ph, SEAFDEC/AQD's Institutional Repository

Traditional bangus culture

The traditional *bangus* or milkfish culture refers to the straight culture of one-sized stock in earth ponds. Modifications by SEAFDEC/AQD are noted, and discussed on pages 9-15.

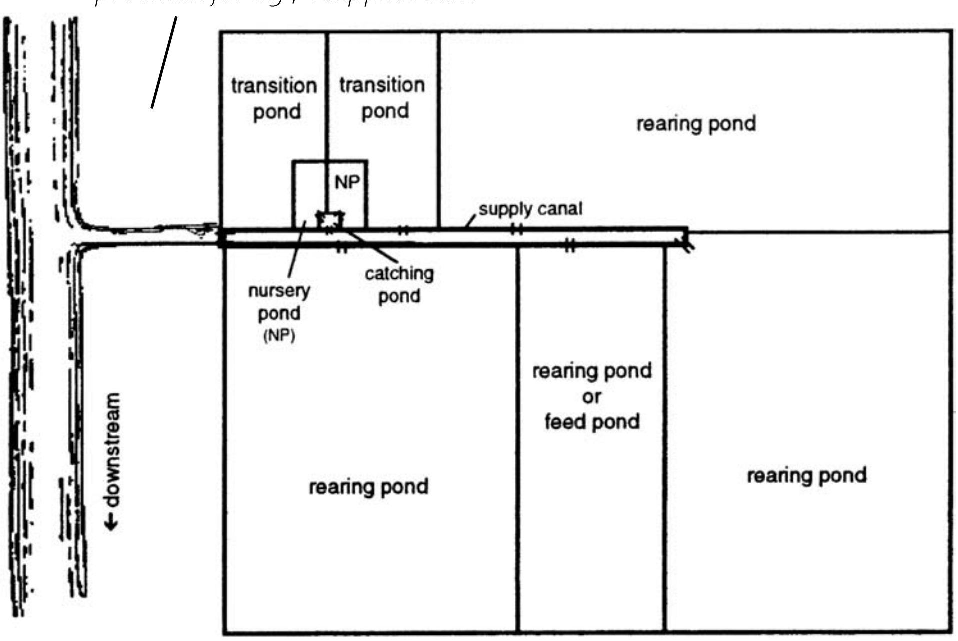
A traditional milkfish farm has several ponds classified according to their uses (refer to pond layout below):

- *Nursery ponds.* These are small ponds used exclusively for the rearing of fry to fingerlings. These occupy about 1 - 10% of the total production area. A manageable compartment ranges from 1,000-5,000 square meters.

  Nursery ponds are best located near the water source. Elevate the bottom so water can be readily drained even at low tide. Do not locate nursery ponds adjacent to perimeter dikes where fry may escape or predators and other unwanted species may enter through crab holes or leaks.
- *Transition ponds.* Fingerlings from the nurseries are kept in transition ponds until they reach post-fingerling sizes or until the rearing ponds are ready for stocking. These ponds comprise about 10-20% of the total production area. Each compartment should range from 5,000-15,000 m^2 in size.

  Transition ponds are located adjacent to nurseries for easy transfer of fry.
- *Rearing ponds.* Post-fingerlings are raised to marketable sizes in rearing ponds. These are the largest compartments, from 1-15 ha each. However, a 5-ha compartment is most manageable.
- *Catching pond.* This serves as a catchment basin for harvested fish, is constructed near the gate of the pond, and is linked to nursery ponds by another gate.
- *Feed pond (also called kitchen pond).* One of the nursery, rearing, or transition ponds may be used as feed pond to grow natural food as supplement or as fattener before the fish are harvested. The feed pond is a separate com-

A buffer zone of intact mangrove vegatation (100 meters from the sea or 20 meters from a river bank) is provided for by Philippine law.

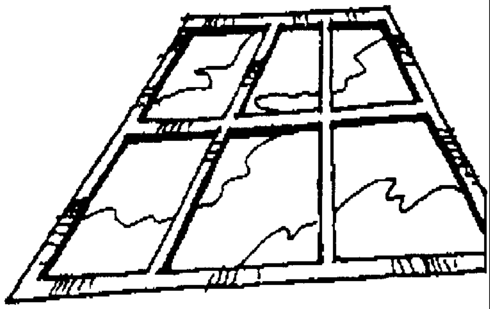


partment, located near ponds where supplementary feeding is needed.

The traditional production system is based on two to three croppings per year. The fry are kept in the nursery ponds for 4-6 weeks until they reach fingerling stage. These are then stocked in the adjoining transition pond for at least one month until the stock have grown to intermediate size (7-15 cm) and until the rearing ponds are ready. Fingerlings of about the same size are stocked in the rearing pond for 2-4 months.

Increase croppings to seven times a year.

*SEAFDEC/AQD recommends the **modular** method.*



The length of culture period depends upon the initial size of fingerlings and the desired size at harvest.

Pond preparation

Drain, till, and level ponds. Till the pond bottom as soon as the water is drained. For small ponds, use a shovel or rake; for large ponds, a rotavator is more efficient. Tilling brings nutrients at the bottom soil to the surface soil layers. It also eradicates weeds and burrowing fish predators.

Level all holes, mounds, and depressions. The pond bottom should slope gradually from the farthest end to the gate.

Dry the ponds. For the first cropping, allow at least 15 days for the pond bottom to dry until the soil hardens and cracks. This is done preferably at the start of the dry period in the locality.

Soil drying is important because it eliminates waste products and obnoxious gases (e.g., hydrogen sulfide) resulting from organic matter decomposition. At the same time, it allows time for other pre-stocking activities.

Repair and install screens. Make all dikes watertight. For leaks, pack new soil against the sides of the dikes. Repair broken slabs in the gates; check grooves to see if they fit; check screens for holes and clean with a soft brush.

These are the recommended mesh sizes for screens:

Pond	Mesh
nursery	fine mesh screen
transition	0.5 cm
rearing	1.5 cm

Substituting bagnets for flat screens offer a special advantage. Although the same mesh size is used, the increase in surface area allows a faster flow of water. The depth of the bag should be 2-3 meters for nursery and transition ponds and 3-4 m for rearing ponds.

Eradicate pests and predators. Pests and predators enter ponds through leaks in the dikes or through inadequately screened gates. This can also happen when fry that are stocked are not properly sorted.

Pests and predators can lower fishpond yields. Carnivorous fish species -- notably tarpon (*buan-buan*), sea bass (*apahap*) tenpounder (*bid-bid*), and gobies (*biya*) - can reduce the stock. Water snakes, lizards, frogs, and birds, like herons and kingfishers, also prey on milkfish.

Other organisms may render the environment unfavorable for fish growth. Tilapia, snails, and polychaete worms reproduce rapidly and eventually compete with milkfish for food and space. At the same time they inhibit the growth of benthic algae by destroying the bottom substrate. Because they burrow and bore, mudcrab (*alimango*), mudlobsters (*kolokoy*) and other crustaceans can destroy dikes and gates and create passageways for milkfish to escape.

Predators and pests may be mechanically removed or eliminated using chemicals.

Mechanical removal. Draining and drying ponds normally eliminate pests and predators. To induce burrowing freshwater species (mudfish and climbing perch) to come to the surface, a fresh supply of water is let in and subsequently drained after a few days. Snails that concentrate along the water line may be picked up manually or collected by means of shovels and rakes. Chironomid larvae are eliminated by a series of tidal flushings.

☞

Predatory birds, frogs, lizards, etc. are either driven away or caught and killed. Scarelines, baits, nets, bamboo contraptions and other indigenous trapping devices are sometimes used,

Chemical methods. Use pesticides only when physical means of control fail or when days are cloudy and there is insufficient time for thorough drying. Pesticides, however, have the advantage of being pest-selective and these reach portions of the pond that cannot be totally exposed.

Aquatin and Brestan have been banned. Use environment-friendly ways to eliminate pond snails.

SEAFDEC/AQD recommends ***piling up 15 cm of rice straw*** *on pond bottom with snails and* ***burning it.***

Organic pesticides are recommended because they are biodegradable. Although more effective, inorganic forms persist in the environment without losing their potency and thus may be lethal to milkfish. Nevertheless, large farms may find it practical to use inorganic pesticides. Read, understand, and follow instructions on the containers carefully. (The organotin pesticides Aquatin and Brestan are banned by the Philippine government. - Ed.)

Apply lime. Most newly built ponds require lime because they are likely to have acidic soils. In acidic soils, fertilization is ineffective and the ponds become unproductive. Response to fertilization is best when the soil pH is brought within the range of 6.5 to 9.0.

Other than helping correct soil acidity and preventing pH fluctuations in ponds, liming has other benefits. It hastens the breakdown of organic matter and the release of nutrients, and to some extent reduces the incidence of gill rot disease in milkfish.

Many calcium and magnesium compounds make good liming materials. The three kinds of lime commonly used are calcium carbonate ($CaCO_3$) or agricultural lime, calcium hydrate ($Ca(OH)_2$) or slaked lime, and calcium oxide (CaO) or quicklime. The amount applied depends on how acidic the soil is. The best way to determine the dosage is by soil analysis.

In the first year of production, 1,000 kilograms per hectare of slaked lime is normally applied. This is spread evenly over the pond bottom, sides and dikes. Old ponds require 500 kg/ha of agricultural lime spread over the pond bottom. To achieve maximum effectivity, the lime is worked into the soil by raking and ploughing. To prevent fixation, allow at least a week to lapse before applying phosphatic fertilizers.

Lime should be applied every other crop or twice annually.

Grow natural food. *Lab-lab* describes the complex association of minute plants and animals that form a brownish, greenish, or yellowish mat on the pond bottom and sometimes float on the pond surface as patches. Among its components are several species of blue-green algae, green algae, diatoms, rotifers, crustaceans, larvae, insects, roundworms, and detritus.

The narrow tidal range in the country favors the cultivation of *lab-lab. Lab-lab* grows well during the dry months in ponds with hard bottoms and salinities of 25-32 ppt. Ponds with a luxuriant growth of *lab-lab* can yield 1,500-2,500 kilograms per hectare per year of fish.

To grow lab-lab: Spread chicken manure evenly over the pond bottom. For a more rapid effect, mix fertilizer with water in plastic containers and allow to stand overnight. Spread evenly over the pond the next day. Use the following amounts:

Crop	New ponds (1-4 years)	Old ponds (at least 5 years)
1st crop	2,000 kg/ha	1,500 kg/ha
2nd crop	1,000 kg/ha	500 kg/ha
3rd crop	500 kg/ha	500 kg/ha
4th crop	500 kg/ha	500 kg/ha

Admit water to a depth of 5 cm. Allow the pond to dry for 3 days. Re-admit water to an average depth of 7.5-10 cm. Apply 16-20-0 at 100 kg/ha or 18-46-0 at 50 kg/ha.

Admit an additional 5 cm of water every 3 days until the pond depth reaches 20 cm. Apply 16-20-0 at 15 kg/ha every 7 days but not less than 3 days before stocking of fish. Three days before stocking, gradually drain 25% of the water from the pond and refill to the desired level. Admit water gradually to avoid disturbing the *lab-lab.* Maintain the following water level during the entire culture period:

Pond	Water depth
Nursery	20-30 cm
Transition	30-40 cm
Rearing	40-50 cm

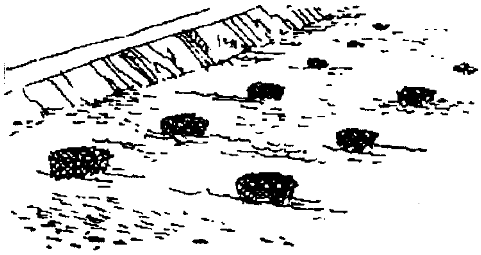
To maintain a luxuriant growth of *lab-lab* in the transition and rearing ponds, apply a side dressing of 15 kg/ha of 16-20-0 every 7-10 days during the rearing period. Stop fertilization 20 days before fish are removed from the pond

To grow lumut: Filamentous or grass-green algae or *lumut* such as *Chaetomorpha linum* (*lumut jusi*), *Cladophora* sp. and *Enteromorpha intestinales* (*bitukang manok*) may be grown in areas where *lab-lab* grows poorly. Ponds with soft bottoms, salinity of 25 ppt and a water depth of 20-60 cm are suitable. *Lumut* is poorly digested by bangus fry and fingerlings. Hence, it is better to decompose and dry it before feeding to milkfish in nursery and transition ponds.

In growing *lumut,* the same fertilization program used for *lab-lab* is applied. Growth occurs naturally but seeding may be needed when growth is sparse. Seedstock may be obtained from ponds where they survive or from special green-algae nurseries. Select fibrous or silky types and plant by staking or sowing. Luxuriant growth is not entirely desirable. Algae and the fish stock compete for living space. Ponds grown with *lumut* yield 900-1,250 kg/ha/yr of fish.

Broadcasting organic fertilizer is back-breaking.

*SEAFDEC/AQD recommends the **silo** method of fertilization.*



To grow plankton: Plankton is the collective term for microscopic organisms suspended in water. This is not as widely grown as *lab-lab* because it requires greater water depth (70-100 cm). Some fishfarmers cultivate *lab-lab* in the dry season and plankton in the wet season. The yield varies from 600-1,200 kg/ha/yr.

To grow plankton, drain the pond and then refill it after a minimum interval of 24 hours. Increase water to an average depth of 60 cm, but preferably to a depth of 75-100 cm. Apply inorganic fertilizer on a platform or sack during or after filling the pond. The rates of application are: 18-46-0 at 22 kg/ha; 16-20-0 at 50 kg/ha; or 16-20-0 at 25 kg/ha with 0-20-0 at 25 kg/ha. Stock the pond one week after fertilization. Apply fertilizer at the same dosage at two-week intervals to maintain water visibility at 20-30 cm. Stop fertilization two weeks before harvest.

Stocking

In the traditional pond system, nursery ponds with abundant *lab-lab* growth are stocked with 30-50 fry/m^2 or 300,000-500,000/ha. Transition ponds are stocked with 10-15 fingerlings/m^2 or 100,000-150,000/ha. In rearing ponds, stocking rate varies from 1,500-3,000/ha for *lab-lab* ponds; 3,000-5,000/ha for plankton ponds; and 1,000-1,500/ha for *lumut* ponds.

Nurseries. The best time to stock is in the cooler part of the day, in the early morning or evening. Avoid

Improve your return-on-investment and payback period.

*SEAFDEC/AQD recommends using **16-20-0 at 50 kg/ha + 45-0-0 at 15 kg/ha** and biweekly schedule of water replenishment.*

☞

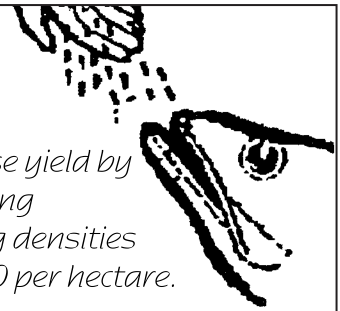
unnecessary mortality by acclimatizing the fry. Partially submerge the fry containers and tilt to one side to allow pond water to flow in. Make sure that salinity and temperature levels in the fry containers are slowly brought close to those of the pond. Allow the fish to swim out.

Sometimes, the fry are pre-stocked in small shaded acclimation ponds. The fry are fed daily with rice bran, patches of *lab-lab* or egg yolk. They are released into transition or rearing ponds by breaking some sections of the dike.

Transition and rearing ponds. Milkfish tend to swim towards a fresh supply of water and the best way to transfer fry and fingerlings is to capitalize on this behavior.

The nursery pond is partially drained at low tide. As water is allowed to enter at high tide, the fish will swim towards the inflowing water out into a confined area in the supply canal. A long drag net or seine is used to collect the fingerlings. They are scooped out into a counting net and then finally into the pond. Care is taken to ensure that a fresh supply of water passes through the confining net and the counting net.

Another method allows water previously stored in the rearing pond to flow into the confined area. The fish swim against this flow of water and enter the rearing pond through a one-way device fixed at the sluice gate.

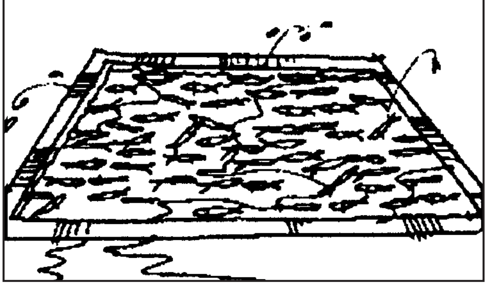


Increase yield by increasing stocking densities to 7,000 per hectare.

SEAFDEC/AQD recommends a ***high-fiber*** *or a* ***balanced amino acid diet as supplemental feed.***

Want to control your fingerling supply?

SEAFDEC/AQD recommends ***stunting*** *milkfish in nursery ponds at* ***20 fish per m^2*** *for* ***six months.***



Pond management

Maintain good water quality throughout the rearing period. Maintain desired water levels. During sudden rains, drain water from the surface or let in water to minimize abrupt changes in temperature and salinity. Pond water becomes layered because of temperature-salinity differences in the upper and bottom water levels. This can lower dissolved oxygen.

If excessive evaporation occurs in summer resulting in increased salinity, use a pump to let in water if tidal water cannot be introduced. Too high salinities -- 36 or 40 -- are stressful to milkfish.

Replenish water or agitate the pond water when fish gasp at the surface or swim in circles. This condition usually indicates low dissolved oxygen especially when *lab-lab* dies during prolonged cloudy weather.

Have a tide table handy (calendars with tide tables are useful). Freshen the pond during the spring tide (full or new moons) or every 14 days. The spring tide lasts 4-5 days. Drain ponds preferably late in the evening or in the early morning 2-3 hours before an incoming high tide. Drain water not lower than the expected tide level.

Give supplemental feed when the *lab-lab* or *lumut* is overgrazed. Feed rice bran, bread crumbs and others at 4-10% of fish body weight. Give half of the ration in the morning and the other half in the afternoon. Artificial feeds may also be given.

Harvest

Make a harvest schedule when the milkfish reach the desired market size (250-300 g). Consider the prevailing market price, the phase of the tide and weather conditions.

Fish prices fluctuate greatly with time. To realize maximum profit, harvest when prices are high, that is, when fish are scarce in

page 15 please

All fingerlings attained a more or less uniform weight gain (0.05-0.066 g/day/fish). Survival, however, was lowest in fish stocked at 30/m^2 (54%) compared to the other densities (78-86%). The cost of producing stunted fish was also highest in 30/m^2 (P0.72/milkfish) compared to the other densities (0.49-0.63 centavos/ fish). The lowest cost per piece and the highest rate of return (33.5%) was at 20 fingerlings/m^2.

SEAFDEC/AQD further tested different stunting durations -- 6, 9, and 12 months -- using the best stocking density of 20/m^2. Weight gain was highest during the 6-month stunting period (0.052 g/day/fish) compared to the other times (0.031-0.037 g/day/fish). Survival was also highest (81 % compared to 52-78%). Cost per milkfish plus a 50% mark-up was lowest, too (P0.71 compared to P0.81 - 1.27).

Stunting - 20 fish/ m^2 -- is economical for the milkfish farmer when maintained up to 6 months. In areas where fry availability is irregular, fry stunting can even be maintained until 9 months.

In terms of investment, the traditional method of preparing ponds is used although nylon-screen substrates are installed like tennis nets across the pond bottom. This increases the surface area by 60% for attachment of fish food organisms.

References:

(1)I Bombeo-Tuburan. 1988. *The effect of stunting on growth, survival and net production of milkfish (Chanos chanos Forsskal).* **Aquaculture** 75:97-103.

(2) DD Baliao, BM Franco, RF Agbayani. 1987. *The economics of retarding milkfish growth for fingerling production in brackishwater ponds.* **Aquaculture** 62:195-205.

(3) RF Agbayani. 1990. *Economics of milkfish culture in the Philippines.* In: H Tanaka, KR Uwate, JV Juario, C-S Lee, and R Foscarini. **Proceedings of the Regional Workshop on Milkfish Culture Development in the South Pacific;** 21-25 November 1988; Tarawa, Kiribati. FAO/South Pacific Aquaculture Development Project and US Agency for International Development. GCP/RAS/116/JPN.

TRADITIONAL CULTURE ... FROM PAGE 8

the market. Normally, this is on full moon nights when not much fish are landed by commercial fishing. Another important rule is to regulate the quantity of fish per harvest to a level that can be absorbed by the market.

Stocks may be partially thinned. Only bigger sized fish which command a higher price are harvested. More natural food becomes available to the remaining stock. Some fishpond operators on the other hand harvest juveniles ranging from 10-20 cm and sell these as bait for tuna.

The current method of harvest — or *pasulang* — takes advantage of the tendency of the fish to swim against the current. It is the same method used in transferring stock from one pond to another. The fish that are confined in the supply canal or catching area are seined or scooped. Sometimes a stationary fish corral or *baklad* is installed in a portion of the catching area near the main gate. The confined fish are also harvested by scooping or seining.

The current method is applicable both for partial and total harvesting. About 80% of the stock can be induced to concentrate in the catching area. The rest are picked up by hand after totally draining the pond.

Chill milkfish to death as soon as these are harvested to maintain fish quality during transport to the market. Immerse fish in tanks containing crushed ice or iced water. Cover the tanks with canvas to protect the fish from the heat of the sun and to prevent ice from melting rapidly. If the travel time is long, use 450 kg of pure crushed ice per ton of fish.

Pack the fish in round galvanized metal tubs (*bañeras*) when these are stiff and cleansed of slime, blood and mud. Plastic rectangular containers or 1 m^3 wooden boxes lined with GI sheets and styrophore slabs may also be used. Pile the fish with alternate layers of ice. Use fine crushed ice to minimize abrasive action and to chill areas evenly. A ratio of 1:1 ice to fish (weight basis) is needed for 3 hours of land travel and 1:2 for 1.5 hours of travel.

Reference: **The Philippines recommends for bangus.** 1983. PCARRD Technical Bulletin Series No. 8-A Philippine Council for Agriculture and Resources Research and Development. Los Baños, Laguna. This manual was produced with the collaboration of the Bureau of Fisheries and Aquatic Resources, SEAFDEC Aquaculture Department, and the University of the Philippines - Visayas.