AQUACULTURE FARMING SYSTEMS

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Aquaculture, fish culture, fish farming, marine farming, mariculture and aquatic husbandry are terms used to describe the water-based equivalent of agriculture. The basics are the same as animal husbandry on land. The goal is maximum production with minimum inputs through proper development and utilization of the latest information available guided by the responsibility of conserving and maintaining a wholesome environment for human existence.

Milkfish farming in the Philippines has a long history of over 400 years. For several centuries this non-carnivorous species continued to be cultured because of its fast rate of growth, low cost of production and high acceptability as food item.

At present milkfish farming can be done in freshwater, brackishwater, and marine water, either in monoculture or in polyculture systems. This paper discusses briefly the aquaculture farming systems for milkfish in all the aforementioned environment specifically on earthen fishponds.

Update of Available Technology

The early and traditional system is characterized by obtaining the stock on whatever fish seeds accidentally get into the ponds with the admitted water. The stock depends on whatever natural growth of food to feed upon which are mostly filamentous green algae. The fertility of the environment is limited and average production was 300 kilograms per hectare per year.

Following this was an improved system in which the number of fish stocked was monitored - the number varies with the available natural food (still mostly filamentous grass green algae), the size of fish stocked and the projected size that should be harvested. This slightly increased the national average production to 350 kilograms per hectare per year.

Next was a much more improved system where little inorganic fertilization was introduced and planting of filamentous grass green alage was practiced to replenish overgrazed fishpond. This system brought up the national average production to 400 kilograms per hectare per year.

With the emphasis given to aquaculture many recent aquaculture farming systems have been developed and claimed to be highly profitable.

In shallow water milkfish farming where the food base is composed essentially of a biological complex of benthic organisms the main bulk of which are filamentous blue green algae mixed with diatoms and protozoans locally known as lablab, the following systems have been developed:

1. The conventional system which made use of shallow ponds from 30 to 45 cm water depth and of conventional pond designs through established procedure, can grow enough lablab to support a standing crop of about 600 kilos per hectare and can produce 2 to 3 crops per year depending on the size of the fingerling used to stock the grow-out ponds.

2. The stock manipulation system is carried in two ways: the first is stocking of different size groups and frequent partial harvesting. This is made by initially stocking three size groups of milkfish fingerlings with a combined weight of about 200 kilos per hectare. In this case the partial stock can efficiently feed on the available natural food without overgrazing until the initial stock reaches a weight of about 600 kilos and at which point partial harvesting of marketable size fish is done to bring down the stock to the original weight of about 200 kilos per hectare. A new stock of small size fingerlings is introduced simultaneously. This partial stocking and partial harvesting cycle is repeated about 8 times a year and could produce more than 3 tons per hectare per year.

   The second is the progression or modular method where the fish is moved from one compartment to the other by water management, the compartments progressively becoming larger as the fish grow bigger usually in four stages. The sizes of the smaller compartments depend on the size of the final stage pond, the stocking rate, and the desired size of harvestable fish. With this method about 5 total harvest from the final stage pond is possible with a total harvest of over three tons per hectare per year.

3. The "kitchen pond system" is the reverse of the modular system because instead of moving the fish stock from one compartment to the other it is the natural food grown from one pond ("kitchen pond") which is transported, by water management, to the culture ponds. A basic observation regarding this system is that the water environment suitable for the luxuriant growth of lablab organism is not compatible

with the general well being of the growing fish. Growth of lablab requires a shallow pond for maximum penetration of sunlight, a pond bottom rich in decaying organic matter which is closely associated with the production of hydrogen sulfide gas and oxygen depletion, a condition which is lethal to the cultured fish and a water containing plenty of essential nutrients and higher salinity, about 45°/oo. In contrary, fish needs a clean freshly aerated sea water not less than one meter depth with a salinity of 15 to 25°/oo. With this system it is possible to stock more fish in a greater volume of water, about 22,000 per hectare, and obtain production of not less than 4 tons per harvest or 12 tons per year at three croppings of fish per year.

4. Increased substrate system. This system was developed at the BAC. Artificial substrate is introduced into the pond where the lablab organisms can attach and grow to provide additional grazing area for the fish in addition to the food that grows on the pond bottom. This system was conceived to anticipate the trend of growing milkfsih from extensive culture to intensive culture. With this system it is possible to increase fish production based on conventional system to about 15 to 20 percent at 60 percent added artificial substrate. This system was found to be good not only for growing marketable fish but also for fingerling production where increased survival was observed. Even for holding the fingerlings stunted for nine months without artificial feeding, the health of the fingerlings was maintained.

Meanwhile, in the deep water milkfish farming, (water depth from 75 to 120 cm) only one system is being developed which makes use of planktonic organisms as food base. In this system it is possible to attain a production of 1.2 tons per cropping or 3.6 tons per hectare per year. But the technology developed for this system is meager and production is unpredictable ranging from 300 to 1,200 kilos per hectare per harvest.

In addition to the systems mentioned there are others that are associated with the non-conventional types of aquaculture farming which are mostly still in the drawing board and on which no sufficient data are available.

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