



The Malaysian experience

By **ET Aldon**

Integrated farming has long been practiced in Malaysia, basically to provide protein requirements needed by the family. It is also a source of income.

Integrated farming not only improves agri-aqua production but it also optimizes the use of land and water resources. Use of feeds is also minimized, thus reducing its effect on the environment.

With fish being promoted on a larger scale, the Malaysian government is providing farmers with financial assistance and hands-on training on fish culture and rice production. Socioeconomists suggest that consumer preference be considered when farmers decide on what crop to raise.

Fodder-fish integrated farming

Fodder-fish integration is widely accepted in Malaysia just like rice-fish farming because: (1) it is environmentally sound; (2) shrimp and fish are of high economic value; (3) seeds are easily available; (4) different niches are used in polyculture, thus minimizing competition for food among different species; (5) the fodder-fish can last for 5-7 years with minimum maintenance; (6) the system is open to the introduction of additional components at a larger scale; and

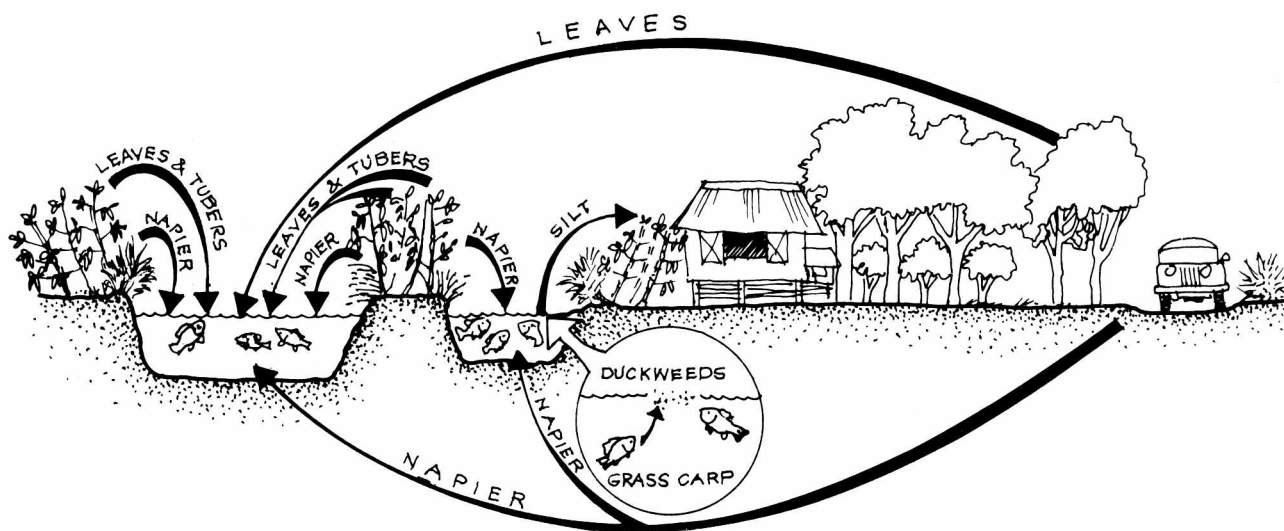
(7) various combinations can be used to get the highest yield and income. Agri-aqua does not take much time and effort in terms of stock management.

The fodder-fish integration utilizes the most commonly used fodder species as feeds like the napier grass *Pennisetum purpureum*, the cassava *Manihot esculanta*, and the ipil-ipil *Leucaena leucocephala*. These have high dietary value, are highly palatable, and digestible.

Fodder crops

About 3/4 of the mature stems of napier grass and cassava are planted at 45°. Napier grass cuttings should have 3-5 nodes while cassava is 25-30 cm long. Ipil-ipil can be directly seeded or transplanted, usually at the start of the rainy season. The plants should be protected from animals and are fertilized every month.

After 6-8 weeks, napier grass are cut 7 cm from the ground to encourage vegetative growth, then cut every 2-4 weeks at 10-15 cm from the ground. First cutting of cassava is about 0.5 m from the ground, 8 weeks after planting and then regularly every 4 weeks. For legumes, first cutting at 0.3 m from the ground is done after 8-12 months then regularly every 8-12 weeks.



Fodder-fish integrated farming



The leaves are chopped in small pieces for feed to hatchlings or fry or leaves may simply be placed in the pond for bigger fish. Cassava tuber can also be included.

Fish culture

The pond, usually 0.1-0.5 ha, should be near the water source. Bunds which are built to separate the ponds should be 2-3 m wide and can hold water 1-m deep. Screened inlet and outlet pipes are installed.

The usual pond preparation is done: (1) drain and dry the pond; (2) apply lime to condition the soil; (3) fill the pond with water 2 weeks after liming; (4) fertilize to promote growth of plankton -- chicken manure at 200 kg per ha for nursery ponds and 300 kg per ha for growout.

Fish are stocked, preferably in the evening. Two options may be tried:

Kechik in 1994 also reported a successful integration of Chinese and Indian major carps with agriculture.

Fish-livestock farming in mine pools

Ahmad Fuad Bin Ahmad and Abdul Khalid Bin Hashim, Assistant Fisheries Officers, of the Department of Fisheries in Malaysia were among the 14 trainees of AQD's 1997 Coastal Aquaculture and Resource Management course. They have gone around Malaysia, providing technical assistance to farmers. Here, they discuss their compatriots' ingenuity in using abandoned tin mine sites for integrated farming in Perak, west Malaysia.

The mine pool is about 5 ha wide and between 10-20 m deep (see illustration below). Farmers apply for a tempo-

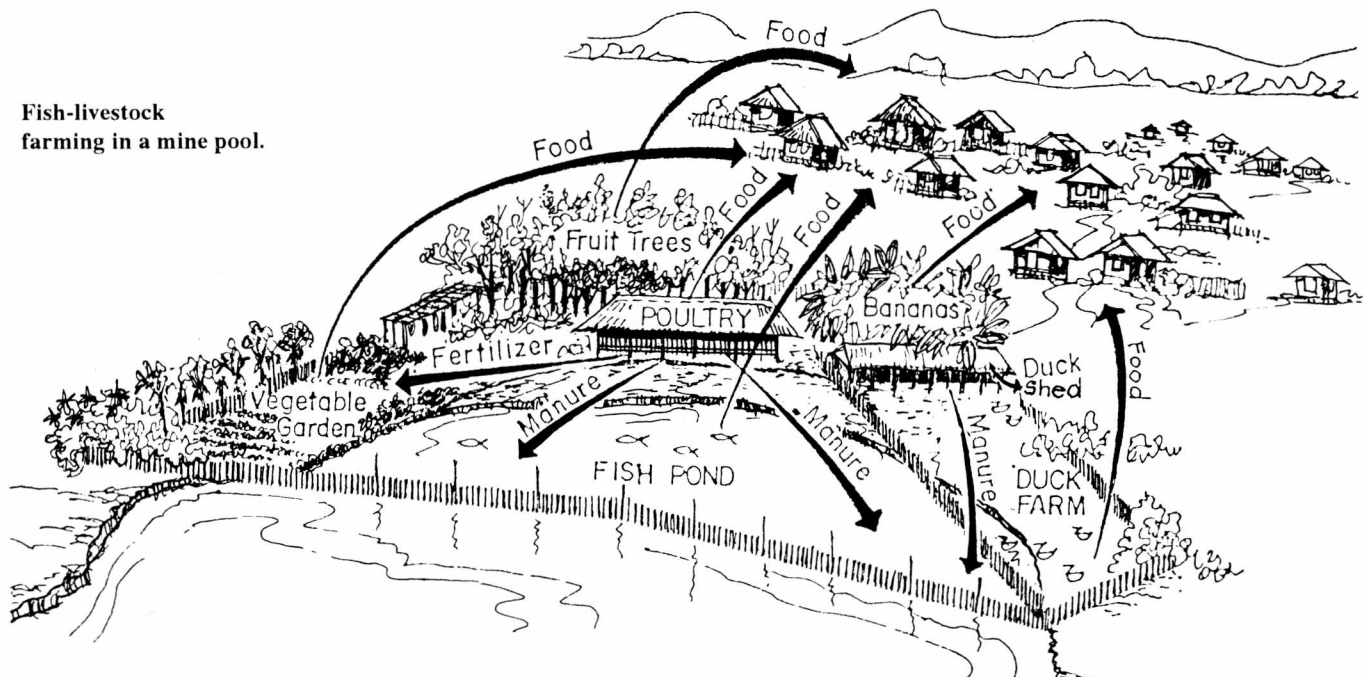
Option 1

Grass carp-bighead carp-tilapia at a 5:1:15 ratio
 Introduce duckweed as carp feed in the first month, then use chopped cassava leaves and napier grass. For tilapia, cooked maize, left overs and cassava are given.
 A farmer could earn M\$6,950 against expenses of M\$1,660 (maintenance, fish seeds, others), a profit of M\$5,490 (US\$1 = M\$2.70)

Option 2

Grass carp-Javanese carp-shrimp at a 1:3:30 ratio
 Feed the fish with rice bran, bread, sago, cassava and napier grass.
 A farmer could earn M\$1,060 but will spend M\$355, profiting M\$705.
 Annual return is 2 cycles per year.

Fish-livestock farming in a mine pool.



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duction. About 10% of the area is covered by canals 80 cm deep for the retention of water at lowest tide. The height of the enclosure is 30 cm higher than the highest high tide.

The study tests the stocking density (0.5 or 1 per m²) and feed (fish by-catch or mixed diet of 75% brown mussel flesh and 25% fish by catch) of mudcrab stocked in the 200 m² pens.

Two months from stocking (initial body weight, 16-25 g; carapace length, 3-4 cm), the mudcrab have attained a body weight of 65-106 g and carapace length of 5-6 cm.

The site is favorable to the study because of an enlightened population. The vast area (70 ha) planted to mangrove testifies to the successful cooperation between people, the government and a non-government organization (NGO). Mr. Frank Sotuniel, President of KASAMA, says that since the mangrove have been planted, people from other towns gather mudcrab, rabbitfish, oysters, blood clam, gobies, etc.

"It is a major source of livelihood," Mr. Sutuniel says. The people have learned to monitor and maintain the mangrove. They watch for cows that feed on the young planted trees, dead wood, plastic, and other debris that would disturb the site. He also said that the young mangroves are attacked by what they call *tusok* worms. When asked why there is an increase of fish, clams, and crabs in the planted mangrove areas, he said "I don't know. Perhaps because they have found a shelter."

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rary occupation land (TOL) license to occupy a portion of the mine pool, costing about M\$ 100 per 0.4 ha though this varies according to state regulation. The duration of the lease is between 33-99 years subject to extension. Ahmad and Khalid say that the government provides technical and financial assistance.

Two to three families enclose a portion of the mine pool where they stock tilapia and bighead, common and grass carps. Tan and Khoo (1980) recommended the following stocking densities: 250:500:250 for bighead, grass and common carps, respectively. The polyculture can give a high recovery rate of 70-100% after 9-10 months.

For livestock, 10,000-20,000 chickens and ducks are raised. A number of huts provides shelter. Water hyacinth may be grown in the lake to serve as duck feed. Trees and vegetables are also grown within the perimeter fence, with animal compost as fertilizer.

Fish-livestock integration is advantageous to farmers in many ways. Clonts (1989) noted that animal wastes are utilized as organic fertilizer for land crops, and can fertilize the fish "pond" if not eaten directly by fish. Ducks can even be the "biological

aerators" in the ponds. These inputs do not cost the farmers anything.

The produce of the farm is sufficient for the family's food requirement. The sale from extra produce can be used for the family's other needs.

Mine pools are potential ecotourism sites, with floating restaurants built along the coast. Ahmad and Khalid say that this business is lucrative.

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AQD's mudcrab-mangrove farm site in Kalibo, Aklan.