



# Agri-aqua farming in Thailand

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Integrated agriculture - aquaculture systems have been in existence in Thailand for centuries. In fact, rice-fish farming started in the country more than 200 years ago. Perhaps Thailand has the most varied integrated farming operations in southeast Asia. Pig, cattle, buffalo, chicken, duck, vegetable, aquatic plant, rice and orchard in combination with fish are practiced. Chinese kale, yard long bean, cucumber, hot pepper, eggplant, tomato, banana, mango, coconut and papaya are the vegetables and orchard plants cultivated. Leaves of these plants and that of rice are composted, serving as pond fertilizer. On the other hand, aquatic plants grown on septage and pond effluent are used as fish feed ingredients (like the water hyacinth *Ceratophyllum demersum*) or as direct feed to fish (*Azolla* and duckweed).

The Nile tilapia *Oreochromis niloticus* is the most popular fish used because it breeds readily and produces high yields. Other species widely raised are the common carp *Cyprinus carpio*; the Chinese carps *Hypophthalmichthys molitrix*, *Ctenopharyngodon idella*, and *Aristichthys nobilis*; the silver striped catfish *Pangasius sutchi*; the silver barb *Puntius gonionotus*; and gouramies *Trichogaster pectoralis* and *Osphronemus goramy*.

Wild fishes which occasionally invade culture ponds during the rainy season such as the snakehead *Channa striata*, the catfish *Clarias* spp. and the climbing perch *Anabas testudineus* increase profits because of their high market value.

## Why rice-fish farming?

The northeast region is the largest in Thailand but its farmers are the poorest. Inferior soil condition makes the agricultural land less productive than its neighbours. Rice, fish and vegetables are the basic diet of the people. Fish, the most important and cheapest source of protein, has become scarcer in natural waters because of overexploitation by the rapidly increasing population. Malnutrition due to insufficient dietary protein has become a problem especially among pre-school children, pregnant and lactating women. This situation makes the northeast region of Thailand the center for development of integrated farming for more than a decade.

In 1984-1987, the government's Ubon Farming Systems Research and Development Unit carried out rice-fish

farming trials in the province of Ubonrachathani. Results of the tests indicated that benefits are higher in rice-fish culture than rice monoculture; the 2-3 cm tilapia fingerlings previously reared in separate nursery ponds grow more rapidly than those stocked directly in rice-fish ponds; and the best yields of rice can be attained in gently sloping areas.

An effective system of promoting acceptance of rice-fish culture among farmers was developed by the Appropriate Technology Association based on its experiences in the region from 1984-87. Known as horizontal transfer of technology, the system encourages prospective farmers to visit and observe successful rice-fish culturists who improved technologies based on their local environment.

The Asian Institute of Technology -- in collaboration with the Thai Department of Fisheries and the USAID Pond Dynamics / Aquaculture Collaborative Research Support Program -- began its outreach project in 1988. Among the successful technologies developed were (1) nursing of fingerlings to predator-free size in netcages prior to stocking in ponds to avoid wild fish predation and (2) supplementation of buffalo manure with urea to increase pond productivity. The outreach project is being extended to other areas.

Another on-going integrated farming project is that of the Bank for Agriculture and Agricultural Cooperatives and the Belgian Administration for Development. The project aims to increase land and labor productivity of small and medium scale farms. The project covers 28 districts in 6 provinces and started 4 years ago. Unlike the previous extension programs, participating farmers in the project are provided with loans.

## Farming operations

Though there are many integrated farming operations, rice-fish, duck-fish and chicken-fish culture are the most preferred systems by subsistence farmers.

### Rice-fish farming

Rice-fish farming is either captural or concurrent. In the captural system, a trap sump (or depression) that is usually 50-100 m<sup>2</sup> and 1.0-1.5 m deep is dug at the lowest area of the field. Wild fish which enter the paddies during





flooding are concentrated in the sump and harvested together with rice. Fish production ranges from 30 to 60 kg per ha per crop.

Bunds or embankments are converted to 1 m dikes in the concurrent system. This prevents escape of fish during floods. Nile tilapia, common carp and silver carp seeds are stocked to completely utilize the food organisms present in rice paddies. Organic fertilization and supplemental feeding with rice bran and broken rice are generally practiced. Estimated fish yield may vary from 125 to 900 kg per ha per crop.

Innovations in rice-fish culture practices to adapt to local conditions have been observed. Examples are extended fish culture in refuge trenches in terraced fields; pumping of water from a pond enriched with manure (from chickens raised over the pond) to adjoining rice fields; and concentrating of fish in sumps outside the field which are connected by a trench.

### Duck-fish farming

Ducks raised are egg layers (peking and khaki campbell) or meat ducks (muscovy duck) depending on the marketability of egg or meat in the area. Ducklings that are 10-14 days old are usually grown in bamboo houses (6 per m<sup>2</sup>) constructed over the ponds. These pens have spaced floors to let manure and excess feed fall in the pond.

Ducks are confined within the water area (2 per m<sup>2</sup>) by fences to avoid bank erosion. Feed is given at 5-10% of body weight, and includes rice bran, maize, cassava leaf and root meals, trashfish, aquatic weeds, soybean, barley and snails. Meat ducks weighing 2-3 kg are harvested after 8 weeks while layers are kept for 1-2 years.

In an experiment using 200 m<sup>2</sup> ponds stocked with 30 ducks given commercial duck feed concentrate and with fishes fed rice bran at 1% of fish body weight per day, the average net total fish yield was 11.6 tons per ha per yr. The fishes stocked include Nile tilapia (1.5 per m<sup>2</sup>), silver barb (1.5 per m<sup>2</sup>) and common carp (0.1 per m<sup>2</sup>).

### Chicken-fish farming

This system utilizes layer or meat birds. Pens housing 10 chickens per m<sup>2</sup> are typically constructed in corners around the ponds. Commercial feeds mixed with broken rice and maize are given twice a day. Meat birds are sold or consumed after 8-12 weeks while chicken which starts laying eggs when they are 5-6 months old are raised until laying period of about a year is over. Due to the richness of chicken manure, several fishes are polycultured in the pond. Fish



yield of 6,000 kg per ha per cropping can be obtained in this farming system.

Other farmers have their chicken pens built away from the ponds. This allows them to gather chicken droppings which they process to protein-rich chicken manure and use or sell as livestock feed or fishpond fertiliser.

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