

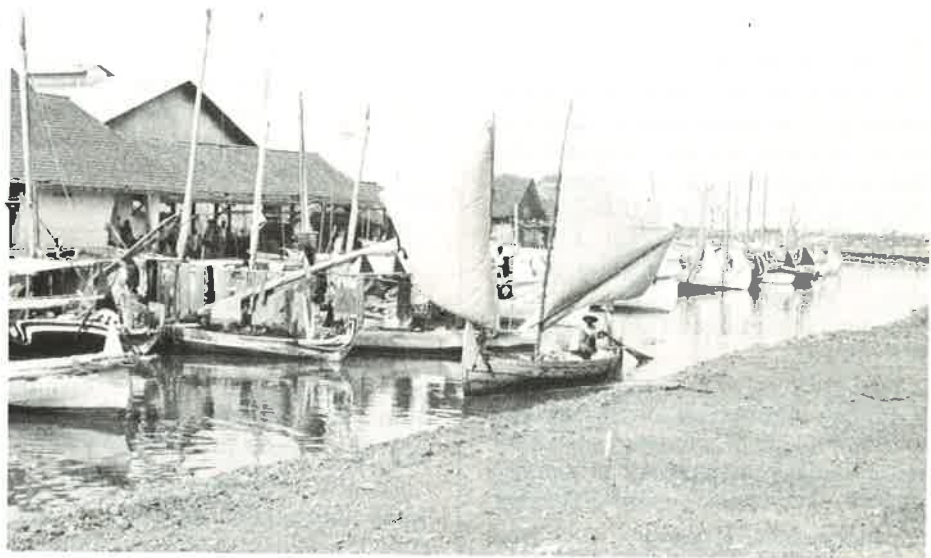
Fisheries Development and Management in Southeast Asia: Spotlight on Indonesia

Indonesia is an archipelagic state boasting more than 10,000 islands and the world's fifth largest population. Its territorial waters total 2.7 million square km, added to which are 13.7 million ha of marshes, estuaries, lakes, reservoirs, and rivers; 182,700 ha of brackishwater ponds; 39,000 ha of freshwater ponds; and 72,600 ha of rice-cum-fish areas. Thus, the country's aquatic resources are rich and their potential for development is promising.

As in other Southeast Asian nations, fisheries activities provide employment for a sizable percentage of the Indonesian labor force (3%). Although fisheries contribute less than 3% to the GDP, fish and fish products are still one of the most important agricultural export commodities and the primary source of animal protein in the country.

Per capita consumption of fish in Indonesia is only 10 kg, (1973) falling considerably short of the 29.5 kg targeted by the government. The low level of consumption allegedly reflects the uneven distribution of the population, most of which is concentrated on Java and is comparatively sparse on the other islands relative to availability of resources. Most of the fish is produced on the outer islands, whereas the centers of consumption are on Java, leading to problems with distribution and marketing. Superimposed on these problems are a lack of handling facilities and transportation which have caused the fish supply to fluctuate and have raised the price, discouraging fish consumption.

A total of 849,000 marine fishermen were engaged in artisanal fishing activities in 1971, 69% of which were fishing full time. About 30% were from Sulawesi, 27% from Java, and 20% from Sumatra. By 1975 there were 242,220 nonmotorized boats in operation, mostly plank-built, and the



Under full sail, an artisanal fisherman from Cirebon, north coast of Java, wends his way home. As of 1975, almost a quarter of a million unmotorized boats were operating in Indonesia and supplying practically all fish sold for domestic consumption.

remaining one-third dugout. Motorized boats still remain a small minority in the the overall fishing fleet, comprising about 6% of the total.

Indonesia's total fish production in 1975 was 1.39 million metric tons, worth Rp. 2.49 billion. Between 1974 and 1975 production showed a rapid surge ahead at a rate of 4% per annum as compared to an average 2.4% p.a. between 1968 and 1973, attributable to increased marine fisheries production arising from development of motorized vessels and introduction of more modern fishing gear such as otter trawls and purse seines to replace traditional traps, hand-hauled nets, and handlines. In comparison, production from inland fisheries showed little change between 1974 and 1975. Inland open-water production decreased from 241,000 to 229,000 mt, while production from fish culture increased from 147,000 to 165,000 mt.

Of the total 1.39 million mt pro-

duced in 1975, 71.7% was from marine waters and accounted for 63% of the value of the total fish landings. Indo Pacific mackerels dominated the catch by weight, contributing 7% followed by scads, 6.8%, anchovies, 6.6% and fringescale sardinella, 6.3%. Fish representing more than 45 genera are caught in commercial quantities, and crustaceans and mollusks contribute another 15 or more genera to the total. Most marine production is concentrated around the north coast of Java and the east coast of the Malacca Straits, and fishing in these areas has sometimes been so intense that stocks on some grounds have been depleted.

Inland fishery landings amount to 93,000 mt, 58% of which represents open-water catch and 42%, production from brackishwater and freshwater ponds, cages, and paddy fields. A total of 294,000 ha is presently under cultivation. Brackish-

water fish culture businesses number 23,000, use about 52,000 ha of ponds, and employ 39,500 farmers. Seventy-nine percent of the farmers own their own ponds, 21% rent. The average income from brackishwater fish culture ranges from Rp. 43,000 to 50,700 per household.

Productivity from aquaculture activities varies among regions, ranging from 180 kg in W. Java to 671 kg/ha in Aceh (cf. Taiwan at 2067 kg and the Philippines at 694 kg). The stocking rate of fry/fingerlings per ha per year is 4100, compared to 6400 ha in the Philippines and 10,500 in Taiwan. Despite the long tradition of pond culture, Indonesia's production has remained low, yet has potential to rise from 360 kg/ha per year to 1,000 kg/ha per year through use of fertilizer, treatment to eradicate predators, a higher stocking rate, and higher input of manpower into large-scale ponds.

The main species raised are milkfish, tilapia, mullet, barramundi, *Puntius*, and several species of shrimp, with milkfish and shrimps comprising 70% and 20% of the landings, respectively. Only milkfish are artificially stocked; the shrimps

are and other species are produced from naturally-occurring seed collected from the sea and placed in ponds. Although milkfish are the most important species cultivated, penaeid shrimps have been gaining popularity due to their high value as an export commodity. During 1975 export of frozen shrimps amounted to 24,000 mt worth \$US75 million or 58% of the weight and 85% of the value of exported fishery products. About 25% of these shrimps were raised in brackishwater ponds. Thus, developing improved methods of shrimp culture is a priority activity, and toward this end, the Shrimp Research centre at Jepara, Central Java, was established in 1971.

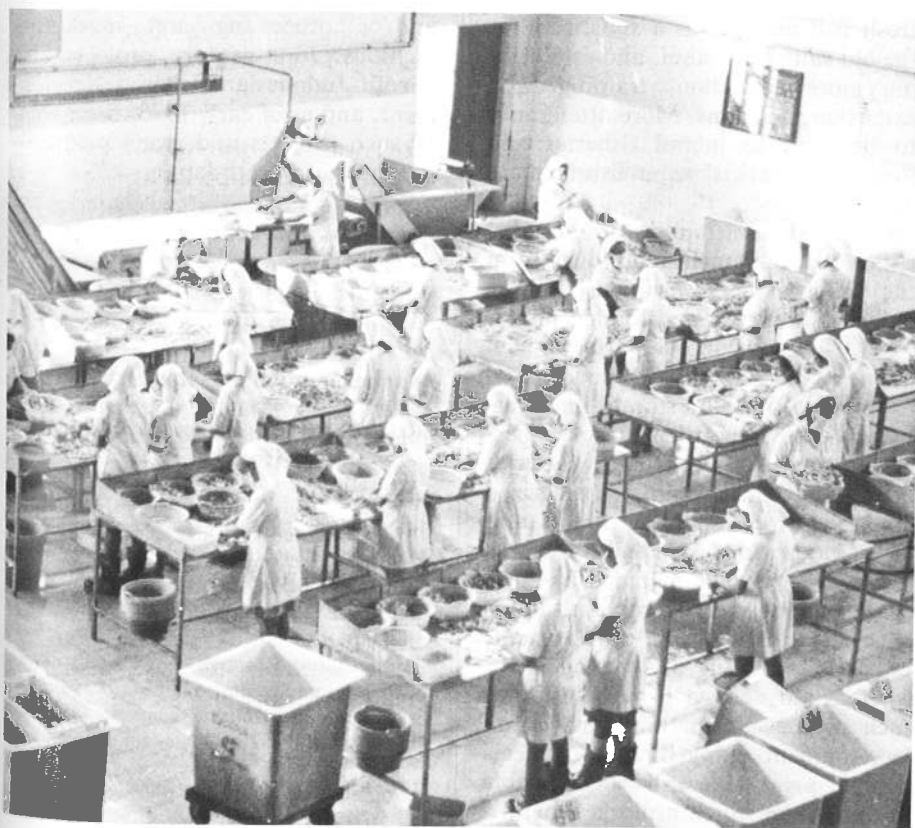
The volume of Indonesia's exports showed healthy growth from 19,700 mt in 1968 to 53,000 mt in 1976; and at the same time their value soared from \$2.8 million to \$131 million, a 47-fold increase. Major commodities exported were frozen shrimps (85% by value), frozen frog legs (3%), fresh frozen fish (2%), salted jellyfish (2%), and ornamental fish, whose destinations were primarily Japan (78%), the U.S. (6.8%), Singapore and Hong Kong (each about 4%), and the Netherlands (3.9%).

Fisheries of Indonesia fall under the aegis of the Ministry of Agriculture, specifically under the Directorate General of Fisheries. Responsibility for managing research institutions within the Ministry is shouldered by the Agency for Agricultural Research and Development (AARD), whereas education and training functions are handled by the Agricultural Education, Training and Extension Board. Other activities—general administration, planning of fisheries development, products development, supervision of state, private and joint-venture fisheries enterprises, and promotion of fishery cooperatives—fall within the purview of the Directorate. Its fisheries programs and collection of statistical data are guided by 26 provincial offices.

There are three governmental research institutes concerned with fisheries research: the Marine Fisheries Institute (Jakarta), the Inland Fisheries Institute (Bogor), and the Fishery Technology Institute (Jakarta). The Marine Fisheries Institute studies the economically important fishery resources, surveys and analyzes fishing grounds and catches, and assesses stocks, in addition to conducting research on fish and *Euchema* culture and means of increasing efficiency of endemic fishing gear and fishing methods.

The Inland Fisheries Institute inventories freshwater species, studies their biology, and develops fish culture techniques. Running-water fish culture was first introduced on an experimental basis by the Institute and was later adopted by farmers,

Shrimp processing plant in Cilacap, south coast of Java, contributes to lucrative export market whose growth in the last few years has been spectacular. Banana prawns (Penacus merguensis) comprise the bulk of the species exported.



Fish market on the south coast of Java. Over half the fish sold in domestic markets is salted, dried, smoked, or boiled.



leading to a 10-fold increase in average freshwater pond production. Researchers have also been able to increase production of Java carp (*Puntius gonionotus*) and common carp by more than 300% by a system of controlled hatching and breeding. At Jepara experiments on intensive culture of *Macrobrachium rosenbergii* are underway, in addition to those on milkfish and prawns mentioned previously.

Emphasis of the Fishery Technology Institute is laid on improving quality of fish and fish products, as well as development of better handling, processing, storage, and marketing methods, and creation of new products. Current projects include developing efficient methods and equipment to preserve shark liver and extract the oil, a source of vitamin A not now utilized, and development of simple, inexpensive ways to produce fish silage from the trash fish by-catch.

Development of fisheries in Indonesia is guided by the Government's Five Year Plan, the second of which was introduced in 1974. Its emphasis has shifted from encouraging exports

to improving traditional fisheries, encouraging development of local fresh fish markets as a substitute for the old salt fish system, and establishing more education, training, and extension programs. More attention is to be paid to inland fisheries and fresh- and brackishwater fish farming as well.

Financial assistance for national fisheries development is obtained from the Indonesian Government, foreign aid, and domestic and foreign investment. The Indonesian Government annually earmarks funds to be used for landing sites and storage and market facilities, resettlement of fishermen, and improving fisheries administration. Foreign aid is derived primarily from bilateral donors and UN organizations such as FAO whose funds are generally matched by those of the Indonesian government, and is generally used for development, education, training, and management, whereas aid derived from institutions such as the World Bank and Asian Development Bank finances projects that the private sector has been unable to undertake. Such projects generally

are pioneering and multidisciplinary efforts and involve a fishing fleet, and/or processing and marketing facilities. Joint-venture projects also benefit Indonesian fisheries development, and as of early 1975, there were 10 such projects underway, primarily in cooperation with Japan.

Information in this article has been derived from the following sources:

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