



Asian Aquaculture

VOL. I NO. 4

TIGBAUAN, ILOILO, PHILIPPINES

OCTOBER 1978

Overviews & approaches

Developing the aquaculture industry of Asia

The Asian food situation, characterized by a downtrend in production growth and compounded by widespread poverty, population increase, and high cost of inputs triggered by the cost of fuel spiral has prompted the countries of the Asian Region to look for and develop new productive capacities. As a source of low-cost protein and an industry that could provide the needed productive surge, aquaculture has become the point of attention among governments. But there are problems.

For instance, outside of China, Asia has not really been making much progress

in aquaculture, according to Dr. T.V.R. Pillay, FAO's global aquaculture program coordinator. Pillay was speaking at the Regional Workshop on Aquaculture Development Strategies for Asia held in Manila on August 6-13, 1978 (see Asian Aquaculture, 1, 3, Sept. 1978).

Pillay traced this to what he called the "vicious cycle of aquaculture being a low-yielding industry and therefore not attracting enough interest and support from governments and investors which in return keeps it a low-yielding, unattractive investment area." Pillay singled out the Philippines as one country



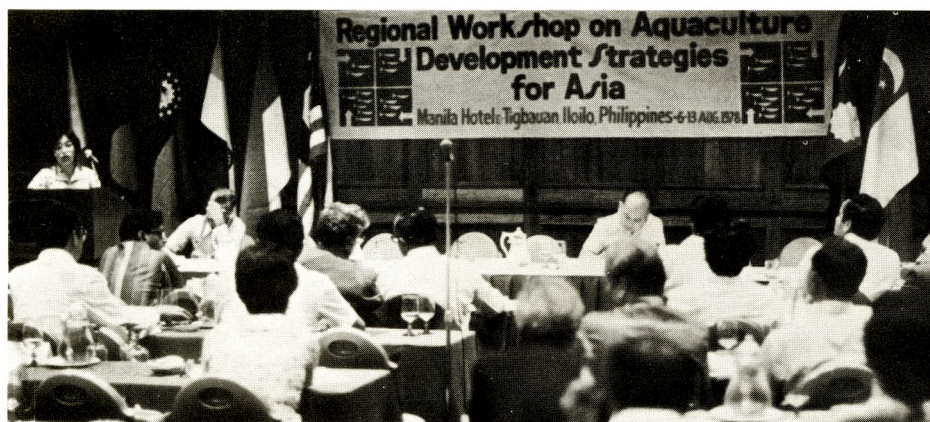
Dr. T.V.R. Pillay
Global Aquaculture Program Head, FAO

where considerable attention and support has been given to aquaculture.

Obviously, steps must be made to get the industry out of this rut, Pillay says, and he suggested the following:

Better application of known technology. With the expansion of areas under culture, present systems of aquaculture production could be intensified using known technology. A basic requisite of intensifying production is the training of manpower especially technicians and senior aquaculturists who can really plan, implement, and supervise aquaculture programs. Training, like research, must also be multidisciplinary and systems oriented in order to produce practical aquaculturists who understand well production systems rather than the intricacies of life histories of fishes, Pillay stressed. Research, on the other hand, should train its attention on the problems that stand on the way of applying known technologies. High priority should be placed in filling the knowledge gaps in relation to the known production systems, he said. This way, known techniques can be improved on.

(Continued on p. 2)



Linkages between government and the private sector and cooperation among national, regional and international agencies should foster efficiency and effectiveness in research and development, training, technology transfer and policy formulation. Above, participants in the Asian Institute of Aquaculture, SEAFDEC Aquaculture Department-sponsored workshop on Aquaculture Development Strategies for Asia discuss schemes for aquaculture R & D cooperation. The delegates came up with the Asian Plan of Action for Aquaculture and Small Fishfarmer Development.

Developing the aquaculture industry.... (From page 1)

Development of new technologies. In preparation for future developments in the field of aquaculture, it would be necessary to embark on the search for new technologies. Pillay emphasized however the need to think of and conduct research in a multi-disciplinary way. "We are talking of production systems, not just culture or food habits or growth rates of fishes."

Again, the basic support services for technology generation must be there i.e. training of scientists, setting up of facilities, and development and institution of training programs to produce the desired kind of scientific workers.

Collection and dissemination of information. The collection, analysis and dissemination of unconventional and published data for use not only by researchers but for fishfarmers is of considerable importance if we have to push a program of aquaculture development, Pillay said. This he said is an activity which needs considerable planning and with the cooperation among regional and national institutions. He cited the fact that many useful production information are often unpublished or sometimes not recorded. These have to be ferreted out, processed, stored, and made available for productive application by fish producers of the region, he said.

To attract investments, Pillay thinks it necessary to demonstrate not only the production capabilities of aquaculture ventures but their returns on investments. Although he recognizes that it is not only the economic return that should be emphasized, he bawled the lack of criteria that can show at present the economic and social and nutritional benefits from aquaculture. Although we have been concerned with these, they are not available in a documented form in which they can be presented to financing agencies, Pillay said. He thinks pilot projects in selected areas are needed to produce information that can be presented to investors to attract them. "I am not aware of any rationalized scheme of conducting pilot experiments or pilot developmental projects to devise the appropriate combination or model for developing aquaculture under various systems."

Pillay mentioned that the 4.5 million

tons a year increase in aquaculture projected by several Asian countries to be achieved in ten years' time requires an investment of around US\$3,500 million. For governments and other institutions to invest this vast amount, they must be shown and convinced of the viability and soundness of aquaculture as an investment area, Pillay thinks.

Conceptual Approach

In the same conference, a top ranking Filipino research administrator outlined an aquaculture development model for Asia which is made up of eight basic strategy components (chart).

Dr. J.D.Drilon, Jr., Director General of the Philippine Council for Agriculture and Resources Research and concurrently Director General of the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) explained the model, thus:

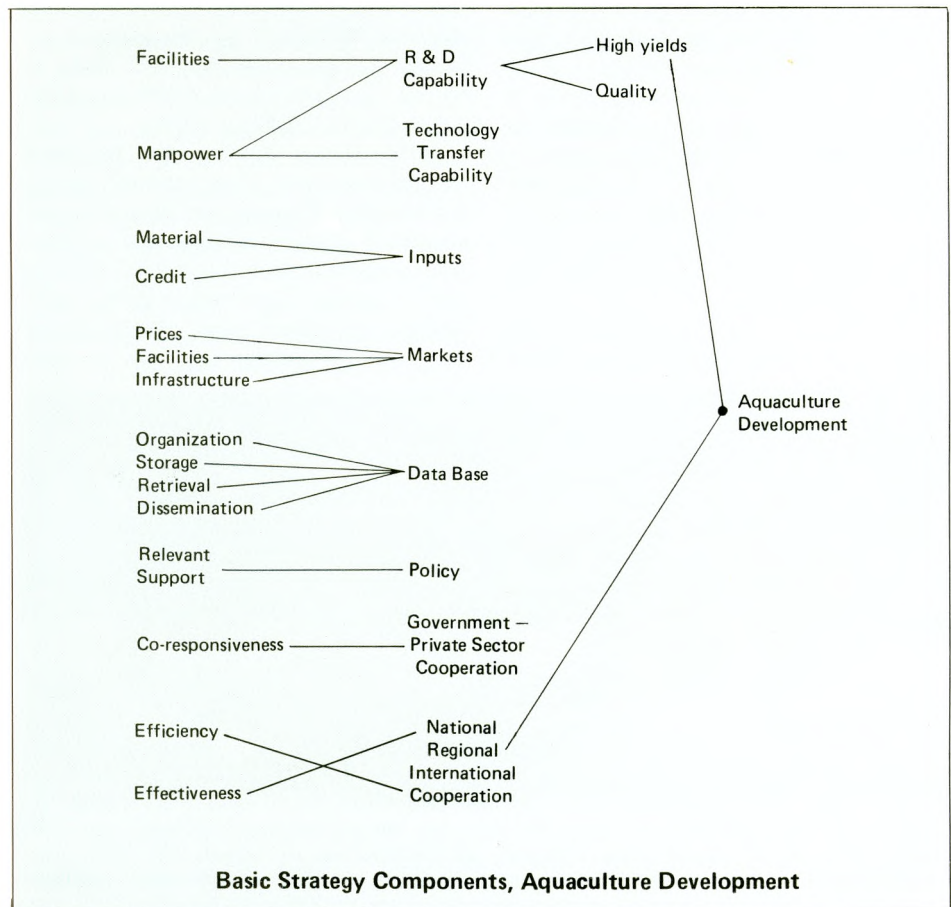
A *Research and Development System* should be developed to the point where it is capable of sustained effort in

generating technology that offers dramatically high yields. The capacity for sustained effort is imperative because the nature of research and development requires, for big successful breakthroughs, the cumulation and build up of lesser events of success. The dramatically high yields are the pay-offs which will facilitate the adoption of more productive technology by farmers. High yields, says Drilon, are not only the incentives but the basic motivators.

Trained change agents are needed in sufficient numbers who could facilitate technology transfer. A manpower training system is needed to make this possible.

Inputs should be available to enable farmers to adopt transferable technology. This should include credit that will enable farmers to purchase the technology inputs including equipment.

A *data base* is needed to organize, store, retrieve and disseminate research and technology information. Such a base is necessary to back up technology



transfer functions as well as provide convenience and continuity to R & D programs.

Lucrative *markets* should be developed. Aquaculture farmers should be able to receive reasonably gainful prices. While prices are basically ruled by the market forces these market forces could be influenced decisively by well-aimed and suitably designed policies.

A conscious effort should be exerted to develop *policy* formulation to support aquaculture development in all its phases — in production, processing and marketing.

Closer *linkages* between government and the private sector should be promoted in order to forge stronger channels of communication between them and ensure co-responsiveness in policy development and implementation.

Stronger *cooperation* is needed between national agencies and regional and international bodies concerned with aquaculture development. Such cooperation should foster overall efficiency in research and development, training, technology transfer and policy.

Drilon suggested operational collaboration between the government and the private sector. Political will, he said, should combine with the firepower and flexibility of the private sector. Government should take the lead in providing for the needed support while the private sector should take the initiative in the pursuit of aquaculture development ventures.

He mentioned a second area for collaboration which is among national, regional and international fishery agencies. They should collaborate in every way possible to avoid duplication and to mutually reinforce and strengthen each other, Drilon said.

The Asian Food Situation

Workshop keynote speaker Dr. D.L. Umali, FAO Assistant Director General and Regional Representative for Asia and the Far East provided a picture of the food situation in Asia. It does not look bright. Firstly, according to Umali, growth in the per capita food production has slipped from 2.8 percent, achieved in the 1960s, to 2.4 percent for the most part of the '70s. He also cited an Asian Development Bank projection of a cereal shortage "anywhere between 24 to 30 million tons" unless the countries of Asia are able to develop new productive



The Philippines' Bureau of Fisheries and Aquatic Resources Director and current SEAFDEC Council of Directors Chairman Felix R. Gonzales (with glasses) receives the first copies of the Small-Scale Sugpo (*P. Monodon*) Hatchery extension manual from author Rolando Platon, leader of the Barangay Hatchery Project of the SEAFDEC Aquaculture Department. Witnessing the turnover are (counter-clockwise) AIA Director Joseph C. Madamba, AIA Deputy Director Thomas G. Flores and SEAFDEC Aquaculture Department Research Director Jose A. Eusebio. Copies of the manual are available at the Communications/Publications Unit, Asian Institute of Aquaculture, SEAFDEC, P.O. Box 256, Iloilo City, Philippines.

Training in *sugpo* hatchery management organized

A six-week training in small-scale *sugpo* (*P. monodon*) hatchery operations is being organized for 10 selected pond operators from October 15 to November 30, in an effort to popularize the farming

of prawn as a primary crop.

The training is an offshoot of new developments in the Barangay Hatchery Project which was organized by the Department to scale down prawn hatchery technology to a level that can be adopted by villages with minimum financial input.

The program includes studies on types of hatchery systems, broodstock development, natural feeds culture, hatchery management, and practicum. It will involve theory sessions on concepts, and techniques of hatchery management and an exercise on actual operation from broodstock development and spawning of *sugpo* to larval rearing including feed culture.

A barangay hatchery consists of small tanks made of marine plywood designed in modules which makes them expandable and transportable. Fully operational, a basic unit is capable of producing 50,000 fry a month.

This will be the second training program on *sugpo* hatchery operations to be conducted by the Department. The first was held from September to November last year at Tigbauan and also involved 10 selected participants of which five have now built their own small hatcheries.

capacities. This trend, he said, is compounded by poverty. Umali said that some 412 million fall in the "absolute poverty" category so that even if we achieve good harvests or a dramatic increase in fish production, the people would not be able to buy the food they need. The only bright spot in the picture is the downtrend in population growth rates in several Asian countries although, according to the FAO officer, the momentum of earlier population booms will still see these countries doubling their population.

The cost of fuel spiral has caused commercial fisheries to stagnate even as traditional fishing grounds are being depleted, he reminded the delegates.

All these pressures, according to Umali, are causing the Asian countries to look for a productive surge in fisheries. This explains the heightened interest in aquaculture, he told the workshop participants. ●



Status and Prospects of and Development in Indonesia, Philippines,

Indonesia

Indonesia is an archipelago of 10,000 islands with a population of around 130 M. It has a land mass of nearly 2 M km² surrounded by 5 M km² of sea.

The economy relies heavily on natural resources. Fisheries has a huge potential although still in a fairly early stage of development. It contributes less than 3% to the national income but fish products are the country's main source of animal protein. Annual per capita consumption however is only 15 kg.

Aquaculture

Fish culture in freshwater ponds and rice fields is being intensified by the use of organic and inorganic fertilizers, compound feed pellets, improvement of pond construction, and through selective breeding. Annual yield from ponds and rice fields is about 99,000 tons of which Java contributes 60%. High yields are obtained in West Java where some farmers get 3000 kg/ha/yr. Most ponds are under one ha in area but there is a trend towards larger and more intensive farming.

Fish production in rice fields — at present about 23,000 tons a year — is being encouraged by the government. Carp is the most intensively cultured freshwater fish. It is easily bred in captivity, the Sundanese method developed in Indonesia being the most successful.

Brackish water ponds comprise around 200 thousand hectares. Small ponds (2 ha or less) make up about two-thirds of the total number while large

ones (15 ha and over) share only 10 per cent of the total. Majority are family-owned and operated.

Annual production of milkfish and prawn is about 70,000 tons. Greatest efforts at intensifying brackishwater farming is in South Sulawesi, North Sumatra, and in East & Central Java where new areas are being brought into production and modern culture methods are replacing old ones.

The government has implemented a program to improve brackish water fish farming methods in Java and South Sulawesi. The program will initially involve 20,000 ha of ponds to be stocked with milkfish and tiger prawns either individually or mixed.

Present production from brackish water culture accounts for only 8% of Indonesia's total fish production although the area of brackish water pond can still be increased to more than 660,000 ha.

Research

Three institutions undertake R & D activities: the Marine Fisheries Research Institute in Jakarta, the Inland Fisheries Research Institute in Bogor, and the Fisheries Technology Institute in Jakarta.

The Inland Fisheries Institute, set up in 1956, concentrates on fish culture in brackish and fresh water ponds. At Jepara in Central Java, the Institute is conducting studies on the culture of prawns and milkfish with UNDP assistance. It has had considerable success with feeding compound pellets and in experimenting with intensive culture of the giant fresh water prawn, *Macrobrachium*.

The Fisheries Technology Institute was established in 1965 to study fish product development, processing techniques, and utilization and standardization of fishing products.

Education in Fishery Sciences*

To support the development of fisheries, education in fisheries science is coordinated by the Ministry of Education and Culture. Higher education in aquaculture sciences is the sole responsibility of the Universities.

Only the Gadjah Mada University and the Institut Pertanian Bogor (Bogor Agricultural University) teach, conduct research, and carry out extension work in the agricultural sciences. Fisheries sciences are taught at both universities but only the IPB has a Faculty of Fisheries.

Since 1963 the IPB Faculty of Fisheries has graduated 309 in fisheries sciences who majored in Fishery Biology, (Capture) Fisheries, and Aquaculture.

A four-year curriculum leading to an equivalent of a B. Sc. degree has replaced the 6-yr. Ingenieur program. There have been problems in its implementation however.

To remedy these problems, the members of the Faculty of Fisheries conducted a workshop recently. Among the workshop recommendations are: (1) in the first part of their program, all aquaculture undergraduates study relevant basic sciences and the principles of aquacultural bio-technology, (2) aquacultural sciences are considered to be constituted by *aquanomics* or aquatic agronomics and *socio-economics* which consists of aqua-business or aquatic agribusiness, and extension, (3) in the second part of their programs, undergraduates are suggested to specialize in either aquanomics or socio-economics. ●

*From the country report by Messrs. Soedadi Moelyosoekarto, Abdul Kahar Rasul Harijoto Suprato, Tadjuddin Daulay, Made Nurdjana & Wignyo Handoko Kusomodwidjojo, participants in the *Aquaculture Research & Aquaculture Management* training programs sponsored by the SEAFDEC Aquaculture Dept. from Oct. 1977 to Feb. 1978.

*This portion was excerpted from the paper contributed by Dean Hasril H. Jasin and Prof. Sutomo Akhmad to the Regional Workshop on Aquaculture Development Strategies for Asia.

Development Strategies for Aquaculture Singapore and Thailand

Philippines

The Philippines (population: 42.1 million in 1975) is endowed with vast inland and marine waters and has a history of aquaculture, primarily devoted to milkfish farming in brackishwater ponds, spanning a period of over 100 years. It has a marine resource base of 1.67 million sq km and an aquaculture resource base that may eventually become a major source of marine food production by reducing the need to capture fish from natural habitats and bringing about full husbandry in ponds, pens and coves.

There are 500,000 ha of freshwater areas available for fisheries development. Extensive areas of coastal waters for mariculture of oysters, mussels and seaweed await to be tapped.

In 1975, about 176,230 ha of ponds converted from mangrove swamps yielded 112,761 tons or a nationwide average of merely 640 kg per ha. Further conversion of an estimated 140,000 ha of mangrove swamplands available for pond development is limited by policies on land use.

Aquaculture development is constrained by low productivity, lack of trained manpower, inadequate technology transfer systems, and general lack of adequate data base.

Sixty-eight schools of fisheries under the Ministry of Education and Culture and 6 colleges of fisheries (1 privately-owned) offer formal education programs in aquaculture ranging from the high school up to the masteral levels. There are very few teachers with advanced degrees in aquaculture. Non-formal education is also undertaken. Projected increase in employment by 1982 shows

a manpower requirement of 42,800 for brackishwater aquaculture; 3,167 for inland waters; and 1.2 million for skilled and unskilled employment in inland and municipal fishery at an average annual increase of 11.4 percent from 1978 until 1982.

Research attention is focused primarily on traditionally cultivated species like milkfish, shrimps, tilapia and carp with priority concentrated on species which are sources of cheap protein, while foreseeing a trend towards intensive fish culture. To support this approach, researches on seed propagation, fry collection, broodstock development, aquaculture engineering, fertilization, pond management, fish nutrition, pollution and control of fish diseases and parasites are undertaken. Related studies on agro-fishery: rice-fish, duck-fish, swine-fish farming and other such combinations are being done with interest being developed in freshwater culture to put into use marshes, swamps, reservoirs and

lakes for pond, pen or cage culture. Other research strategies are on post-harvest handling, processing and marketing to maximize utilization, minimize wastage and gain more income from aquaculture operations.

Aquaculture extension aims at least to double the productivity of existing ponds. The Bureau of Fisheries and Aquatic Resources (BFAR) operates pilot aquaculture extension projects as well as demonstration fishfarms for field testing of newly-developed technologies from research institutions. Extension workers numbering 350 at present undergo training courses before they are fielded. With assistance from external sources, the Bureau will put up extension training centers in selected areas of the country and a freshwater hatchery which will provide the fry requirements of rice-fish projects and other fish production units in Central Luzon.

Financing for aquaculture development comes from domestic and foreign sources. Domestic sources include government funds, domestic savings of banks, and private individuals. The bulk of foreign loans comes from the International Bank for Reconstruction and Development. From 1965 to 1977, some P33.9 M was channeled to the fishpond and fishpen industry, representing 74.9 percent of total loans granted to aquaculture, the remaining 25.1 percent going to financing of fishing boats.

Present strategies for financing aquaculture development give more importance to improving existing fishponds rather than developing new pond areas to realize increased production over a shorter period of time at lesser investment. Development of freshwater fish culture, seafarming and lake fisheries will supplement incremental aquaculture production. ●



*From the Philippines country report prepared by the Filipino delegates to the Regional Workshop on Aquaculture Development Strategies for Asia.

R & D Notes

Singapore

Only 615 km² in area and with a population in 1977 of 2.3 million (1.2% annual growth), Singapore's economy is nevertheless running much better than most SEA countries with her rapid industrialization and the development of sophisticated servicing facilities. Its GNP, at current market prices, in 1977 was about S\$15.7B (US\$1 = S\$2.30). Per capita GNP, also at current prices, was S\$6789.

Commerce, manufacturing and transportation continued to be the leading sectors. Agriculture and fishing (1% of GDP) and construction and quarrying (6% of GDP) were the lagging sectors in 1977.

Fish is an important part of the Singaporean diet — 30 percent of the total animal protein intake. Per capita fresh fish consumption is 29 kg/year; total animal fresh fish consumption averages 60,000 tons, 75 percent of which is imported.

The Fishing Industry

In 1976, of the 16,500 tons landed, 61% was from offshore catches, 35% from inshore waters, 4% from aquaculture.

The development of capture fisheries has not achieved its targets due to the limited fishing grounds and resources and the strong competition of labor and capital from other sources. This is aggravated by the high cost of fuel and the new regime of the seas.

Aquaculture

It is still in its initial stage of development in Singapore, aquaculture. Freshwater aquaculture practices are traditional. With little management the old practices have limited yields. As a result, some freshwater ponds have been converted into the more lucrative ornamental fish farming and sport fishing purposes.

Ornamental fish and plants are pro-

*From the country report prepared by the Singapore delegates to the Regional Workshop on Aquaculture Development Strategies for Asia.

duced mainly for export (fish — S\$19M, aquatic plants — S\$2.3M in 1977).

Aquaculture produce — 650 tons in 1976 — is solely to supplement local fresh fish consumption to which it contributes 1%. Of the 1976 output, more than 90% came from freshwater carp ponds. There are at present 325 ha of freshwater ponds and 375 ha of brackish-water impoundments as well as some 2,000 ornamental fish farms.

Research & Development

Aquaculture development rests on Fisheries Division, Primary Production Department, Ministry of National Development. Work is spearheaded by the Aquaculture Unit (AQU) in the Changi Fishery Research Complex and the Freshwater Fisheries Laboratory (FFL) in the Sembawang Experimental Field Station. AQU does R & D on marine and brackishwater aquaculture; FFL is involved in the culture of freshwater food and ornamental fish.

Research into the development of intensive aquaculture systems has yielded encouraging results. Studies have shown that marine fin fish culture in floating cages and raft culture of mussels gained production rates of 40 kg/m²/annum and 120 kg/m²/annum, respectively. Running water tank culture of *Chauna micropeltis* yielded 70 kg/m³/6 months.

The national aquaculture research and development program aligns fish farming with animal husbandry. The first 5 years of the program will focus on the following research areas which are necessary for paving the way for large-scale development of a viable aquaculture industry: (a) induced breeding for self-sufficiency in seedlings (b) fish nutrition and feed formulation (c) prevention and control of diseases (d) molluscs culture including post harvest and depuration technology (e) environmental control and management and (f) aquaculture engineering and management.

The second 5 years will be the development phase which will consist of (a) development of accelerated extension and training programs for farmers, *kelong* (fishing stakes or traps) operators

Plan for the c of aquacultur

Fisheries is the second most important natural resources sub-sector in Thailand with a 3.66% share of the gross domestic product. Annual production from aquaculture in fresh and brackish water is about 55 thousand tons, in addition to the yearly marine catch of 1.5 million tons.

Recognizing the importance of fishery to the economy, the government has stipulated in the 3rd National Economic and Social Development Plan (1972-76) that the overall increase in fish production from marine and inland sources and from aquaculture should not be less than 7% per year.

To reach this target, the government has formulated the following policies:

1. Conserve the fully exploited fishery resources of the country through sound management programs;
2. Develop coastal aquaculture with special emphasis on shrimp culture;

*From the paper prepared by Dr. Deb Manasveta, Mr. A. Sidthimunda, Mr. U. Pongsuwano, Mr. S. Swegwan, and Dr. T. Bhukaswan, Department of Fisheries, Bangkok.

and displaced inshore fishermen (b) provision of adequate land and coastal waters suitable for intensive aquaculture at nominal rentals (c) protection and control, through legislation, of aquaculture investments and activities (d) expansion of inland and coastal waters including those of outlying islands available for aquaculture development (e) improvement and conversion of existing brackishwater impoundments into well-managed ponds.

Return on Investment

Production target is 10,000 tons by 1988, representing about 13 percent of the projected fresh fish demand. This is estimated to gross S\$30 million annually, considered a very reasonable return on an investment of S\$1.5 million annually for R & D on aquaculture and ornamental fish culture. ●

Development in Thailand

3. Develop deep sea fisheries by exploiting new fishing grounds;
4. Accelerate the production of fish from inland sources;
5. Raise the standard of living of small-scale fishermen.

Role of Aquaculture

With the expected change in the sea regime, marine fish production could be considerably reduced, say, in the order of 250 to 300 thousand tons. Hence, emphasis is being placed on the exploitation of under-utilized pelagic resources, intensification of inland fisheries development, and aquaculture development.

Advances in aquaculture technology, a favorable climatic condition, and opening up of potential areas for fish culture could help replace some of the expected loss in marine production.

Objectives of Aquaculture Development

Long term goals are to maximize production of aquafarms and to establish aquaculture as an economically viable industry, with a view to providing more employment, generating ancillary industries, and increasing foreign exchange earnings.

To achieve these goals, research and extension will be intensified. During the 4th National Economic Development Plan (1977-81), the Department of Fisheries will concentrate its activities in (a) research on pond engineering and management, environmental control, genetic improvement, nutrition and fish feed development, parasites and diseases identification and control (b) land reforms for providing adequate areas for aquaculture (c) accelerated extension program (d) lake and swamp improvement (e) provision of adequate loans for aquaculture. In the Plan, the government is giving priority to rural development. For fisheries, this would hasten the development of small-scale fish farming and increase economic activities in rural areas.

Extension Services

Under the ten-year aquaculture de-

velopment plan, extension activities will be intensified to include the production and dissemination of manuals on cultivable species and on different systems of aquaculture; training of fish farmers on pond management, bookkeeping and handling; establishment of pilot farms in centers of aquaculture industry; establishment of seed production centers for selected species for culture like prawn, catfish, etc., and on-the-spot advice on various aspects of aquaculture to private companies, joint ventures, and small-scale farmers.

Personnel Training

A number of technical officers from the central and local governments need training to supervise production activities in the field. They include the provincial fisheries officers and the managers of field demonstration fish farms or stations. These technical officers are also responsible for training of field extension workers.

Organization of research

The Department of Fisheries has developed a number of research facilities which necessitates the hiring of more specialists. Long term research requirements are to find solutions for maximizing production of seed of cultivable species and yield per unit area, and for reducing production costs. Research is also needed in the fields of marketing and distribution. But immediate studies are needed on environmental control, stock manipulation, feeds and feeding.

Financing and credit

A recommendation has been made to

augment present funds allotted for loans to cope with the program expansion. The Bank of Agriculture and Agricultural Cooperatives has been suggested as the executing agency for the loan. An appeal was made to make the conditions for obtaining loans favorable to borrowers particularly the small-scale fish farmers.

Aquaculture Education*

Fisheries education in Thailand is conducted at four levels — universities, agricultural schools, vocational schools of agriculture, and high schools.

The Faculty of Fisheries of the Kasetsart University provides advanced training in fishery science as well as research on this field. Since 1943, the Faculty has graduated 602 fisheries biologists. Present enrolment is 201 students. The Faculty provides, through its four-year curriculum, a broad education and professional training in fishery science with specialization in fishery biology, aquaculture, fisheries management, marine science, and fishery products. The University has three fisheries stations, a faculty strength of 6 Ph.D.'s, 21 M.S., 9 B.S. degree holders as well as 9 guest lecturers.

Current research in aquaculture in the Faculty include studies on frogs; breeding

(Continued on page 8)

*This portion is from the paper, "Recent accounts of Aquaculture Education in Thailand" by Dean Mek Boonbrahm of the Kasetsart University Faculty of Fisheries prepared for the Regional Workshop on Aquaculture Development Strategies for Asia.



M.V. PAKNAM, a training vessel of the SEAFDEC Marine Engineering Training Department based in Bangkok visited the SEAFDEC Aquaculture Department in Iloilo, Philippines, recently. Photo shows trainees shooting the sun. This year's trainees were composed of 22 Indonesians, 10 Thais, 4 Malaysians and 7 Filipinos. Skipped by Lt. Vichitra Sitothai of the Royal Thai Navy, PAKNAM's annual cruise brought them this time to the Ports of Manila and Iloilo.

ADB okays technical assistance for Pakistan fisheries project

The Asian Development Bank has approved a technical assistance grant to Pakistan to help prepare a fisheries development project aimed at stepping up exploitation of the country's large fish resources, improving the nutritional standards of its people, generating higher incomes and more employment in the fishing industry, and increasing foreign exchange earnings.

The grant will finance the foreign exchange cost of a feasibility study by nine experts who will work with Government personnel and local consultants to formulate the Second Fisheries Development Project.

In line with priorities set by the Pakistan Government, the team will examine several potential project components. These include: mechanization of coastal artisanal fisheries; introduction of a pilot scheme in offshore purse seining and/or tuna longlining operation; exploitation of demersal species by offshore trawlers; improvement of the existing Karachi Fisheries Port; construction of a new fisheries port in the Korangi Creek area near Karachi establishment of onshore and marketing facilities at the new port site; establishment of an FRP or ferrocement boat-building yard; and development of inland fisheries/aquaculture in the Provinces of Sind, Punjab and the North-West Frontier.

Although Pakistan's marine and inland fisheries are already an important source of food and income for its people, production in the industry is still far below potential. Under its Fifth Five-

Year Plan (1978/79 — 1982/83), the Government of Pakistan has attached great importance to the development of fisheries.

The Bank earlier provided a \$6.73 million loan to the Agricultural Bank of Pakistan to finance the foreign exchange cost for importation of marine diesel engines, fishing gear and other items for the Fisheries Development Project. Some 400 fishing boats equipped under the loan are now in operation. ●

Thailand... from page 7

and culture of *Oxylectris marmoratus*; shrimp and prawn culture; biology and farming of oyster; marine fin fish culture; design of automatic fish feeder; studies on feeds and nutrition; and many others.

Short term training courses are also offered aside from consultative and advisory services to the industry.

Other Universities offering special courses in aquaculture, biology, or marine science are the Prince of Songkla University, Khon Kaen University, Chulalongkorn University, and the Institute of Agriculture Technology.

Eight agricultural schools in the country also provide training for prospective fisheries workers. They provide 3-year and 5-year diploma courses for students who have passed Mathayom Suksa 3. Majority of the provincial and district fisheries officers and fisheries aides in the Department are graduates of these schools. ●

Tropical ecology symposium to discuss ecology and development

The University of the Malaya and the International Society of Tropical Ecology (ISTE) are jointly organising an International Symposium on Tropical Ecology scheduled for April 16 to 21 next year in Kuala Lumpur, Malaysia.

Theme of the symposium will be "Ecology and Development," it was announced by the organizers.

The symposium has been prompted by the fact that the present bio-physical, ecological and socio-economic conditions in tropical regions present a challenge for modernizing their economies and societies.

The theme will be explored with respect to the biological, physico-chemical, socio-cultural and politico-economic aspects of some 13 development areas including aquaculture, land-use, coastal and mangrove resources, riverine resources, freshwater resources, conservation, evolution, dipterocarps, ricefield ecosystems, forest and agro-ecosystems, public health, education and manpower and legislation.

Strategies for ecologically acceptable development, that is, in the context of tropical developing countries, will be formulated.

The International Association of Ecology (INTECOL) is also helping in the preparations for the symposium.

For details and inquiries, communicate with:

Dr. J.I. Furtado, General Secretary,
Organising Committee, International
Symposium on Tropical Ecology,
Universiti, Malaya
Kuala Lumpur, Malaysia

ASIAN AQUACULTURE is published monthly by the Asian Institute of Aquaculture, Aquaculture Department, SEAF-DEC.

EDITORIAL ADVISERS

D.K. Villaluz Q.F. Miravite
R.S. Ignacio J.M. Garay
J.C. Madamba J.A. Eusebio

T.G. Flores

EDITOR

Pedro B. Bueno

EDITORIAL ASSISTANT

Nick Primavera, Jr.



P.O. Box 256
Iloilo City 5901, Philippines