



# Asian Aquaculture

VOL. 3 NO. 6

TIGBAUAN, ILOILO, PHILIPPINES

JUNE 1980

## Need More Trained Workers for Asian Aquaculture

Shortage of trained manpower is slowing down the progress and expansion of Asia's aquaculture industry. Nine Asian countries including Japan have reported they suffer from inadequacy — in number and capability — of trained personnel at all levels, from skilled technicians to professionals and scientists. The Philippines seems to be the only Asian country with a great number of fishery school graduates of the 4-year bachelors and 3-year technical courses. Even then, the common feeling among educators and managers of fishery and

aquaculture enterprises is that a large number of these graduates do not possess the proper training for aquaculture work or are not adequately prepared. Elsewhere in Asia, the common complaint is the lack of graduates, facilities or funds for conducting appropriate training courses.

Contained in the proceedings of the first aquaculture development strategies workshop for Asia (Manila, August 1978) are the status, problems and recommendations regarding aquaculture manpower training from the 68 participants repre-

senting Bangladesh, India, Nepal, Singapore, Sri Lanka, Thailand, Indonesia, Japan and the Philippines. It was the general feeling among the participants that the region has inadequate skilled manpower to support present aquaculture programs and their expansion.

### Status

**Bangladesh.** Formal training in fisheries at the B.S. and Ph.D. levels is conducted by the faculty of fisheries

*(Continued on page 2)*



Iloilo Provincial Governor Conrado Norada keynotes the SEAFDEC Institute of Aquaculture 2nd anniversary program on May 23. Reviewing the events that led to the establishment of the SEAFDEC Aquaculture Department in the province, the governor said the Western Visayas regional programs for self-sufficiency in protein food, health and economic development have been enhanced by the Department's presence and work. Governor Norada is also West Visayas regional development council chairman. He pledged support to the Aquaculture Department's program. Others in photo are (l-r) SIA training head J.A. Agbayani, SIA director J.C. Madamba, Aquaculture Department deputy chief Kunio Katsutani, private fishfarming industry representative Ceferino delos Santos, and Dr. Chhorn Lim, head of the Department's main station at Tigbauan, Iloilo.

## Need More Trained Workers for Asian Aquaculture *(From page 1)*

of Bangladesh Agricultural University while non-formal courses on fish culture and extension are offered for fisheries personnel by the Chandpur Fisheries Training Institute. In addition, a graduate training institute has been set up for extension workers and fishfarmers.

**India.** Formal and non-formal programs for fisheries education and training are available in several universities and fisheries institutes at the bachelors, masters and doctoral levels. Agricultural universities like the University of Agricultural Sciences, Tamil Nadu Agricultural University, and Konkan Krishi Vidyapaeth have built up fisheries colleges and faculties. Meanwhile, a freshwater aquaculture research and training center has been established at Orissa. The Central Inland Fisheries Research Institute of the Indian Council for Agricultural Research also provides technician, scientist, and farmers' training on top of its research functions.

**Indonesia.** Bogor Agricultural University's faculty of fisheries offers the 4-year B.S., 2-year M.S. and Ph.D. programs. Eight other universities are offering 6-year masters of science programs while a vocational high school in Bogor gives formal education on agricultural techniques which include aquaculture.

Training centers run by the directorate general of fisheries offer short courses for fishery officers in freshwater and marine culture. These are at Sakabumi and Probalingo for freshwater and at Jepara for marine culture. Adult education classes for pond operators are also done by the fisheries directorate in districts where demonstration ponds are located.

**Japan.** Several universities and research institutes are offering degree and non-degree programs for fisheries education at the technician, bachelors and masters levels but there are not enough institutions which offer Ph.D. level training. A program for the exchange of researchers and students from Japanese universities with those from other Southeast Asian countries was being prepared by the education ministry.

**Nepal.** A World Bank assisted program to develop Nepal fisheries includes the educational and training component. Until recently however no formal or non-formal training program was being offered although a curriculum for

fisheries training was under consideration for implementation by vocational schools.

**Philippines.** Six colleges and not more than 60 schools have formal programs in fisheries education mostly at the certificate/diploma and bachelors levels. The University of the Philippines offers an M.S. in fisheries major in aquaculture degree in cooperation with the SEAFDEC Aquaculture Department while three national institutions and the Aquaculture Department conduct non-formal training courses of various nature and duration for researchers, technologists, technicians, farmer operators and other aquaculture workers.

**Sri Lanka.** No institution offers a formal degree program in fisheries but non-formal training for researchers, support staff members and fishfarmers are conducted. Degree-oriented programs

including aquaculture. High schools also offer subjects on aquaculture.

### Problems

Poor quality graduates, few trained workers, inadequate training facilities and insufficient funds to work out better training programs. These are the basic difficulties cited by the country experts who attended the regional development strategies conference.

Bangladesh pointed to inadequate facilities for demonstration, not enough money and shortage of experienced and qualified teachers and trainers as its main problems to aquaculture manpower development. India reported lack of trained people and inadequate facilities while Indonesia added inadequate education of training staff,

---

*Poor quality graduates, few trained workers, inadequate training facilities and insufficient funds are the basic difficulties of most Asian countries.*

---

in other countries are availed of for Sri Lanka's fisheries and aquaculture personnel.

**Singapore.** As in Sri Lanka, no formal degree program in fisheries is available but related courses are being offered in some institutions. In-service training for technical personnel is practised.

**Thailand.** Kasetsart U through its faculty of fisheries offers a certificate course and the B.S. and M.S. programs. The Faculty also maintains three stations two of which are capable to conduct training in marine and estuarine culture. Other institutions offer related courses. Among these are the Khcn Kaen U which has an aquaculture program in its faculty of agriculture, the Chulalongkorn U with a strong biology program, and the Institute of Agricultural Technology which offers courses in aquaculture.

Thailand's agricultural schools provide 3-year and 5-year diploma courses with a wide range of subjects in agriculture

methods and facilities. There is no funding for the exchange of expertise, mentioned the Indonesian report.

Japan, on the other hand, pointed out as a limitation the lack of institutions offering Ph.D. programs as well as the relatively small number of trained people for aquaculture education work.

Nepal had for a long time practically no personnel equipped to handle training in aquaculture for all levels of competency. At the other end, the Philippines with its too many schools suffers from poor quality graduates. A survey revealed the acute lack of physical resources for training. On top of these, there is no reliable data base on which estimates can be based on the kind and quantity of expertise needed for the industry.

Sri Lanka obviously suffers from an almost total lack of training capability for aquaculture. Singapore specified

*(Continued on page 6)*

# 29 Asians Attend International Training Programs of AQD

Eleven participants from three Asian countries are attending the two-month international training course on aquaculture management at the SEAFDEC Aquaculture Department in Tigbauan, Iloilo. With emphasis on milkfish, the course started on May 5 and will run up to July 5.

Of the participants, 6 come from the Philippines, 3 from Thailand, and 2 from Malaysia. The Filipinos are Merlou Sy Egco, Corazon Cervantes, Ma. Lourdes Garcia, Simeona Eugenio, Angelita Elbo and Remedios Baga. The Thais are Songsri Mahasawasde, Twee Chindamakul and Wichit Chawiwannakorn. The two Malaysians are Tadie Bayuhan and Zainal Ibrahim.

The course is aimed at upgrading the capability of farm managers, pond owners and operators, technicians and extension workers. The major topics in the course include pond and pen construction, nursery/grow-out pond management, stocking, feeds and feeding, pest/disease control, water management, farm recording, harvest and post-harvest operations, and marketing. A workshop on fish farm analysis and planning exercise will be given about the last week of the course.

The aquaculture management course is the second to be offered this year under the international training program of the Department. The first course, the aquaculture research methodology course, is now being attended by 14 trainees. Five come from Malaysia — Jephris Wong, Jafar Sani, Ali Awang, Rosli Hassan and Misri Samingin, four from Thailand — Wanpen Meenakanachana, Dawee Chantarasri, Opas Decharuk and Niwat Sutemchikul, four from the Philippines — Jose Manzano, Alejandro Olandez, Abundio Galicia and Rogelio Gudmalin, and one from Indonesia — Mr. Endi Setiadi.

The 4-month aquaculture research methodology course begun on April 7 and will end on August 7. It is designed for aquaculturists who have little or no training or experience in doing aquaculture research.

Meanwhile, four Asian fishery officers are undergoing on-the-job training on milkfish culture: Saridi Sahat and Sani

bn Mohammad of Malaysia and Tajuddin Daulay and Chumaedi Zaini of Indonesia. Their training is being sponsored by the International Development Research Centre (IDRC) of Canada through its third country training grant.

One more course under the international training program is slated to be held from August 25 to October 25 this year: the aquaculture management course with emphasis on prawn.

## National Training Program

This year's national training program of the Department also reeled off with

the holding of the prawn culture course from April 14 to 19. Fifteen Filipino participants, coming mostly from the private sector, completed the course.

Soon to be held is the course on small-scale prawn hatchery operation (July 28 -- August 27). The schedule of the courses on mussel and oyster farming, special skills training and in situ training program will be announced later.

The training program of the Department was instituted in 1974 and since then, some 1,968 trainees from Asia and other developing countries of the world completed various short-term non-degree courses. ●

## Int'l Foundation of Science Sponsors Study on Brine Shrimp

The International Foundation of Science (IFS) has approved a US \$7,000 research grant for a study on the integration of *Artemia salina* or brine shrimp production with salt production and milkfish/prawn nursery in earthen salt ponds.

Proposed by Ms. Jurgenne H. Primavera, a researcher of the SEAFDEC Aquaculture Department, the study will look into how a salt pond could be efficiently used for integrated aquaculture production. Its three-fold objectives are to: a) establish the feasibility of *Artemia* cyst production in earthen salt ponds, (b) integrate *Artemia* rearing into a traditional salt-milkfish nursery production scheme and (c) produce *Artemia* adults in a kitchen pond for use as food in fish and prawn nurseries, for incorporation in formulated pellets, and other aquaculture uses.

According to Primavera, the significance of the study can be seen in the light of the dependence of prawn and milkfish hatchery operations on expen-

sive imported *Artemia* cysts as a critical food for fry. Also, successful integration of salt-fish-*Artemia* production would considerably raise farmers' income, she added.

A one-half hectare *Artemia* salt pond at the Department's Leganes station in Iloilo has been prepared for the study. Salt production will be by solar evaporation and the *Artemia* strain to be reared will be the San Francisco Bay strain. The Sorgeloos method of rearing will be followed.

According to the study timetable, year 1 will be spent to establish parameters for the integration of the three uses in one area, year 2 will be for verifying results of the previous season, and year 3 will be for packaging and disseminating the technology and for further refinements.

This is the second grant from the Stockholm-based IFS. First was the study on *Chanos chanos* energy protein requirement of Dr. F. Pascual, a nutrition researcher of the Department. ●



## Management of Fishponds with Acid Sulfate Soils\*

(Last in a series)

### 10. Effect of Nitrogen and Phosphorus Application on Primary Productivity in Acid Sulfate Soils:

Acid sulfate soils identified earlier were flooded for a 4-week period before application of any fertilizer. Eight combination treatments of different amounts of N and P were applied every two weeks (Table 8) and periodically phosphorus concentrations in overlying water and primary productivity were monitored.

The treatment that received 120 kg N/ha and 30 kg  $P_2O_5$ /ha resulted in highest algae growth followed by a treatment with 60 kg N/ha plus 30 kg  $P_2O_5$ /ha (Table 8). These two treatments produced significantly more algae than any other treatment. The lowest dissolved oxygen of 3.01 and 2.46 g  $O_2/M^3$  was recorded in the treatments that received no fertilizer or only 30 kg N/ha, respectively. The highest mean dissolved oxygen 4.82 g  $O_2/M^3$  was recorded for the treatment of 120 kg N/ha plus 30 kg  $P_2O_5$ /ha, which seems to be the best treatment for algae production, but a treatment of 60 kg N/ha plus 30 kg  $P_2O_5$ /ha may still be more economical. Our findings are in agreement with the findings of Swingle and Smith (1939) and Feldman and Suchowiji (1961) as cited by Wolny (1966).

The application of nitrogen or phosphorus alone was no better than control which received no fertilizer (Table 8). This again supports the earlier findings of Singh et al (1976) who indicated that if phosphorus is limiting in a soil, hardly any benefit can be drawn by the application of nitrogen and/or potassium alone. The study also indicates that the ratios of nitrogen and phosphorus are more important for algae production than their absolute amounts of application.

\*Contributed by Dr. V. P. Singh, soil and water management specialist at UP BAC.

Table 8. Mean <sup>1/</sup> dissolved oxygen g/ $M^3$  per day and  $PO_4$ -P concentration (ppm) for different N and P combination treatments, BAC, Leganes, Iloilo.

Treatment <sup>2/</sup>	Oxygen <sup>3/</sup>	Phosphorus
1. 0 N + 0 $P_2O_5$	3.01 c	0.01
2. 0 N + 30 $P_2O_5$	3.32 b	0.43
3. 30 N + 30 $P_2O_5$	3.70 b	0.43
4. 30 N + 60 $P_2O_5$	3.25 b	0.39
5. 30 N + 120 $P_2O_5$	3.50 b	6.38
6. 30 N + 0 $P_2O_5$	2.46 c	0.05
7. 60 N + 30 $P_2O_5$	4.29 a	0.03
8. 120N + 30 $P_2O_5$	4.82 a	0.25

<sup>1/</sup> Mean of three replicates.

<sup>2/</sup> N and  $P_2O_5$  values are in Kg/ha

<sup>3/</sup> Means in the same column followed by a common letter are not significantly different by DMRT (0.05).

The lowest phosphorus concentration in water (0.013 ppm) was recorded for the treatment which received no fertilizer; while the highest concentration (6.38 ppm) was recorded for the treatment which received the highest amount of  $P_2O_5$  (Table 8). The  $PO_4$ -P concentrations in other treatments were in between these two extreme values. It is clear from the observations that the  $PO_4$ -P concentrations in water were strongly affected by the amount of phosphate added.

This study also showed that  $PO_4$  concentrations were depleted after about 3 weeks of application. This was perhaps due to 1. Uptake of phosphorus by

Plankton as they grew older and 2. adsorption of phosphorus into bottom soil in form of iron and aluminum phosphate. This also suggests that repeated applications of N and P in small quantities maybe necessary for good and sustained algae growth throughout the culture period.

### 11. Management of Acid Sulfate Soils for Aquaculture:

Considering the aquaculture problems associated with acid sulfate soils, development of fish ponds in mangrove areas should be done with caution, and prior to any development work, a detailed soil

survey is advised. In addition to analysis done in the laboratory, landform and the vegetation in the area can also indicate the presence of acid sulfate soils.

Once an area has been identified as having acid sulfate or potential acid sulfate soil conditions, a decision whether to develop it or not must be made. Acid sulfate soil conditions are undoubtedly detrimental to fish culture but they can be improved. The costs of improvements, however, are unknown.

Our earlier experience indicate that leaching, liming and proper fertilization can improve acid sulfate soils. Some of our ponds were tilled to speed up oxidation and subjected to tidal flushing and washing by rain water to leach away undesirable sulfates and metals i.e., aluminum and iron. Subsequently the same ponds received different amounts of lime and chicken manure (Table 9). There was a marked improvement in total fish production in ponds that received lime compared with the unlimed controls. Application of chicken manure with lime further improved fish production.

A study presently underway at Carles, Iloilo, where pond bottom was tilled twice to speed up oxidation and level the pond bottom, subsequently flushed and washed several time with seawater showed a marked increased in pH from 3.70 to 6.25. Also, the dikes of the pond were leached by pumping the seawater to remove the acids, which, if not leached would render the pond bottom acidic in subsequent rains. When chicken manure at the rate of 5 t/ha was applied to the pond bottom, it showed a good indication of lab-lab growth. The study is continued for further investigations.

In reclaiming acid sulfate soils, two approaches are possible in addition to applying chemical amendments:

(Continued on page 6)

## Edible Crustaceans in the Philippines\*



### 19. *Trachypenaeus fulvus* DALL

English name: Brown rough shrimp,  
Hardback prawn

Philippine name: *Kuakit* (Tagalog)

Maximal body length is approximately 10 cm. It usually has 8-9 dorsal teeth but none ventrally. The rostrum is almost straight. The ventral surface is convex, giving the tip a slightly upcurved appearance. The telson has 2 subapical and 4 minute lateral spines. Antennal scale is extended beyond the tip

of the antennular peduncle.

Its body is densely pubescent, varying from mid to light to yellowish brown. Pleopods are usually light brown and pereopods are darker.

At present, this species is found in Australia and in Philippine waters where it mostly inhabits the open sea with high salinity. It is usually available for rural consumption only.

by H. Motoh; 19th in a series

## Management of Fishponds . . . *(From page 4)*

1. Limit pyrite oxidation and try to inactivate existing acidity by maintaining a high water table. This may be a relief but only temporary and problem is very likely to occur.
2. Drain intensively to achieve maximum oxidation of pyrite and try to remove the acidity by leaching. In any acid sulfate soil, the quantity of acids present is not unlimited. Therefore, if these acids by one way or another can be removed or neutralized, the soil should become neutral in due course of time. The process of periodic drying and flushing with seawater of both the pond bottom and dikes is recommended. This should be followed with liming and proper fertilization.

### 12. Conclusion

The development of fish ponds in mangrove areas should be done with caution, and prior to any development work, a detailed soil survey is advised.

Once an area has been identified as having acid sulfate soil conditions a decision whether to develop it or not must be made. If an acid sulfate area has been developed into fish ponds the acids present in the soil must either be removed or neutralized to improve the pond conditions and fish harvest. Acid sulfate soils are undoubtedly detrimental to fish culture but they can be improved. The costs of improvement, however, are unknown.

Although much work has been done on the use of acid sulfate soils for agriculture, for aquaculture, perhaps our center is the only research station doing researches on it.

In the past few years, we have made considerable progress at least in identifying the problems caused by acid sulfate soils. A broad range work is needed for the improvement and management of these soils for aquaculture. Finally, while the reclamation of acid sulfate soils is difficult, it is not impossible and is within our reach and capability. ●

End of series

## Need more trained . . .

*(From page 2)*

lack of technical expertise in aquaculture engineering, fish nutrition and fish diseases as its manpower problems. Finally, Thailand reported it sorely needs financing for training programs and that it is admittedly short of qualified personnel "in some fields."

### Upgrading All Levels

Evidently the comprehensive way to solve this manpower capability lack is to have a concerted move to upgrade the quality of manpower at all levels — from the scientist and educators themselves to the practitioners and technicians — supported by the upgrading of the capabilities of institutions to handle training programs by propping up their facilities, support structures, and probably in some cases by improving their existing curricula and training programs.

Five categories of workers have been identified for training on specific fields of specialization and levels of expertise: educators and trainers, researchers, extension workers, producers, and administrators.

Generally for Asia, the first group would need university training at the doctoral, masters and bachelors levels on the following major disciplines: biology of aquatic organisms, aquatic ecology, biochemistry, microbiology, biometry, engineering, economics and sociology. Others, particularly the training staff, could benefit highly from courses in technical schools and training centers on production technology and harvest and post-harvest technology of aquatic products.

Researchers obviously need high-level programs on a wide range of disciplines. For extension workers, the suggestion to have them trained at the certificate, bachelors or masters levels along areas that are appropriate for their work. Their training should be such that they must at least possess the competence and confidence to work with producers.

Producers need skills training along production technology, harvest and post-harvest technology, courses on credit, marketing economics, cooperatives and other useful fields such as project management.

Administrators on the other hand could be more effective with intensive training at the bachelors, masters or

*(Continued on page 7)*

**Table 9. Total fish production (kg/ha) in ponds given various level of lime and chicken manure inputs following tilling and repeated leachings (after Camacho, 1977).**

Treatment	Production before Treatment Application <sup>1/</sup>	Production after Treatment Application <sup>2/</sup>
1. No lime; 2t/ha chicken manure	336.5	419.3
2. 4t/ha lime; 2t/ha chicken manure	478.5	555.0
3. 8t/ha lime; 2t/ha chicken manure	402.7	565.6
4. 4t/ha lime; 8t/ha chicken manure	689.0	929.8
5. 8t/ha lime; 8t/ha chicken manure	412.2	805.0

<sup>1/</sup> Before tilling and leaching.

<sup>2/</sup> After tilling and leaching.

# New SEAFDEC Publications

## Fish Farming Handbook

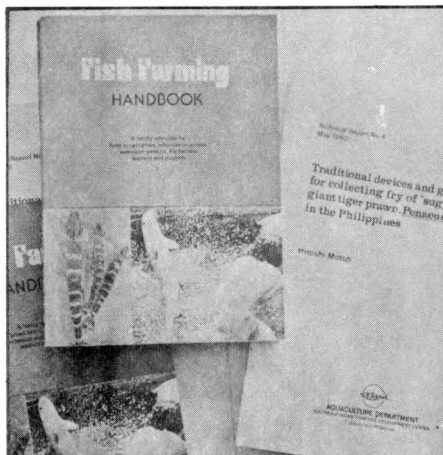
This handbook is designed to be a source book for workers engaged in bringing knowledge and technology to fishfarmers. It is also a handy reference for fishfarmers themselves.

The 300-page, 6 " x 8½ " handbook is the result of 19 months of searching, compilation, editing and crosschecking work by the staff of the Communications/Publications unit of the SEAFDEC Institute of Aquaculture.

Classified under 7 headings — general aquaculture information, milkfish, prawn, tilapia, mussels and oysters, crabs and other species, and integrated farming — the articles emanate from various sources and contributions. Private aquaculturists, government technologists, researchers and scientific workers, scientists from other research centers and institutions, and the staff of the SEAFDEC Aquaculture Department themselves have in various forms and manner furnished the materials for the articles found in the handbook.

The handbook can be bought by mail for P30 within the Philippines and US \$7 for foreign orders. Payments may be made in checks or money orders addressed to:

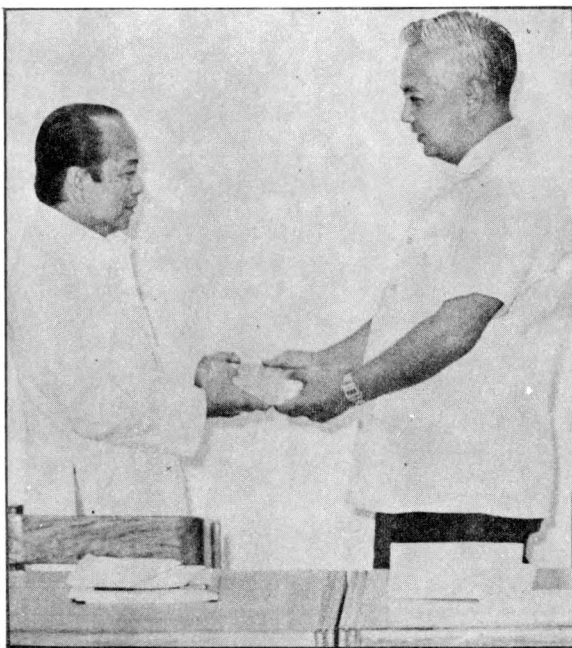
The Director  
SEAFDEC Institute of Aquaculture  
P.O. Box 256  
Iloilo City, Philippines



## Technical Report No. 4 — Traditional devices and gear for collecting fry of "sugpo" giant tiger prawn, *Penaeus monodon* in the Philippines by Hiroshi Motoh.

Describes and illustrates 8 typical devices and gears which have been traditionally used in the rural areas of the Philippines for collecting sugpo (*P. monodon*) fry. Mr. Hiroshi Motoh, a Japanese visiting scientist assigned as ecology project leader at the SEAFDEC Aquaculture Department, conducted the study and wrote the report.

Requests for copies may be addressed to the Communications Officer, SEAFDEC Institute of Aquaculture, P.O. Box 256, Iloilo City, Philippines.



Governor Norada of Iloilo Province receives copies of Fish Farming Handbook from Dr. Madamba during the SEAFDEC Institute of Aquaculture 2nd anniversary program.

## Need more trained . . .

(From page 6)

doctorate levels on management balanced by meaningful exposure to the industry's technical component.

### Cooperation

Recommendations were made for the establishment of cooperative programs among countries or research systems such that the following can be undertaken:

At the national level, (1) research by undergraduate and postgraduate students in national research institutions under joint advisorship with university faculty; and (2) appointment of scientists of research institutions as part-time faculty members, *vice versa*.

At the regional and international levels, (1) exchange of expertise and information on manpower development; and (2) establishment of consortium arrangements among universities and research institutions for postgraduate degrees and training.

### Data Center

A data center for education and manpower training was proposed for establishment. This could be housed in an existing regional center. The center would obtain, maintain and update inventory on data related to aquaculture education and manpower training such as institutions, media of instruction, admission requirements, curricula, faculty, training and library facilities, available scholarships, country manpower needs, literature, socio-economic information, and case studies for documentation. It would also provide such services as library exchange, bibliographies, quarterly news bulletins, literature translation, and information on movements of scientists and specialists within or into the region.

An exchange program for faculty members and scientists as well as for students and technicians was also looked into. Study tours, formal or informal exchange programs, visiting scientists, and fellowship schemes for sabbatical or study leave are among those recommended.

Finally, it was suggested that a system for monitoring and evaluating the effectiveness of training programs for artisanal aquaculturists, technicians, and extension workers be established. ●

# 2nd Aquaculture Business & Management Course Starts July 28

The second Aquabusiness Project Development and Management (APDEM) workshop sponsored by the SEAFDEC Aquaculture Department and the Los Banos-based Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) will be held from July 28 to August 16, 1980 at the University of the Philippines College of Business Administration at Diliman, Quezon City.

This 20-day course (the first one ran for 14 days) deals with the integration of the technical and business management aspects of fishfarming in the Philippines and in Asia and is designed to provide managers and entrepreneurs with the necessary management tools to increase their effectiveness in identifying, developing, implementing and evaluating projects in the aquabusiness sector. Project study component involves three major areas: market, technical and financial. Major topics cover project and opportunity identification, the concept of aquabusiness, managerial tools for developing and implementing project activities and evaluation of the culture, market and financial feasibility of milkfish, prawn and tilapia farming in brackishwater ponds and freshwater pens and cages.

Additional features of the course include a management game developed by UP, SEARCA and SEAFDEC tailored for aquabusiness; case analysis of a milkfish project, prawn project and tilapia project; and field visits to brackishwater ponds in Bulacan, Pampanga and Panga-



**Participants to the first APDEM course play management game specially tailored for aquabusiness.**

sinan, freshwater pens and cages in Laguna Lake and San Pablo, and the integrated crop-fish-livestock trials in Central Luzon State University (CLSU).

Lecturers come from SEARCA, UP, the freshwater fisheries stations of CLSU and SEAFDEC.

A fee of P3,500 (\$480 for foreign participants) will be charged per participant to cover course materials, course-related field trips, refreshments, and other costs incurred in the course. The participant is expected to bear his expenses for transportation to training site as well as board and lodging. An application fee of P300 is required. This is non-refundable but will be deducted from the basic seminar fee.

*Deadline for application is July 15.*

Those who are interested may contact:

Dr. J.C. Madamba/Atty. J.A. Agbayani  
SEAFDEC, P.O. Box 256  
Iloilo City, Philippines

*or*

SEAFDEC Makati Office  
4th Floor, Kalayaan Bldg.  
Corner Salcedo & De la Rosa Streets  
Makati, Metro Manila, Philippines  
Tel. No. 87-57-91 to 94

*or*

Prof. E.S. Tayengco  
SEARCA, Los Banos  
Laguna, Philippines

ASIAN AQUACULTURE is published monthly by the SEAFDEC Institute of Aquaculture, Aquaculture Department

**ADVISER**

Joseph C. Madamba

**EDITOR**

Pedro B. Bueno

**ASSOCIATE EDITORS**

A.R. Benedicto      R.D. Lapastora

**Photography**

D. E. Valenzuela

**Artwork**

H. R. Juntaria  
P. O. Legaspi, Jr.

**Typesetter**

T. C. Cansancio



P. O. Box 256  
Iloilo City 5901, Philippines