Asian Aquaculture

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Aquaculture scientist, aquaculture research center receive PCARR awards

The 1979 Pantas and Tanglaw awards of the Philippine Council for Agriculture and Resources Research (PCARR) went to an aquaculture scientist and an aquaculture research center. The awards are yearly presented by PCARR to honor individuals and institutions for their distinguished achievement in research. This is the first time the awards are granted for achievement in aquaculture research.

Dean Domiciano K. Villaluz, former chief of the SEAFDEC Aquaculture Department, received the Pantas Award for his pioneering research on prawn culture. The induced prawn spawning and hatchery technology that he developed will stabilize prawn fry supply for the fishfarmers. The award is likewise in recognition of his lifelong mission of proving to Filipino farmers that a piece of land near the sea can be made productive with a little imagination, technology and determination.

The Freshwater Aquaculture Center of CLSU got the Tanglaw Award for its outstanding technological breakthrough in tilapia culture research. The simple technology package consisting of a viable hatchery-nursery system, sex reversal system and rice-fish technology that the Center has developed is likely to increase tilapia production as additional source of protein for Filipinos and provide source of income for farmers.

D.K. Villaluz

The Meaning of the Awards

Tanglaw is a Pilipino word which means light, a guiding light; illumination, as spiritual, cultural or intellectual enlightment. As used in the awards presentation, Tanglaw connotes torchlike wisdom or knowledge that guides its subjects toward a definite goal.

The Tanglaw Award serves to honor deserving agencies and institutions who have meaningfully fulfilled their avowed tasks geared towards the various development programs of the nation.

And while Tanglaw is to agencies and institutions, Pantas is to individuals who have contributed to the advancement of agricultural research in the country. Pantas is a Pilipino word which means sage, a wise man, an intellectual.

Tri-commodity farming system discussed

Efforts to raise production in small Asian farms have been weighed down not so much by limited resources as the inefficient utilization of such resources. One of the means to use farm resources to the fullest extent is to integrate more than one commodity in the overall farming scheme. This has been practiced with numerous variations by small Asian farmers. For lack of technological and management support however these attempts at integrated farming systems operations have remained inefficient.

The latest concept in integrated farming includes three commodities – crop, livestock and fish. A farming system suitable for small Asian farms has been the focus of discussion and analysis among some 20 scientists and technologists from 7 countries in Asia.

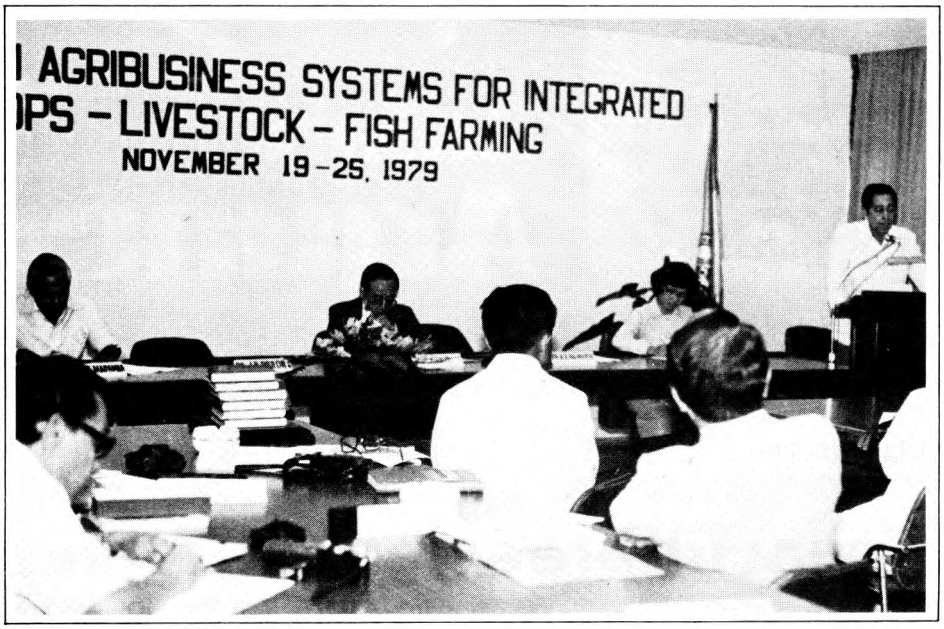
The experts met recently in a one-week conference held in the Philippines to look for ways to develop production and management strategies for an integrated tri-commodity farming system. It was the first such meeting held on this area. *(Continued on p. 2)*

Tri-commodity farming system... *(from p. 1)*

Specifically, the group worked at identifying recycling methods on crop-livestock-fish farming; determining the required production inputs for such a farming system; identifying problems and strategies to maximize the use of resources, particularly among the countries represented; and developing case studies for the analysis of problems and practices as well as project proposals to work out the tri-commodity farming system economically.

Among the experiences presented were those from Thailand, Taiwan, the Philippines and other countries which demonstrate the technology for the system.

The workshop was held from 19 to 24 November at the headquarters of the Philippine Council for Agriculture and Resources Research in Los Baños, Laguna, Philippines. It was sponsored by the Taiwan-based Food and Fertilizer Training Center of the Asian and Pacific Council, the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), the SEAFDEC Aquaculture Department, and PCARR. The experts came from Japan, Korea, Indonesia, Malaysia, Taiwan, Thailand, and the Philippines.



PCARR deputy director-general for research Ramon V. Valmayor welcomes the participants to the Seminar-Workshop on Agribusiness Systems for Integrated Crops-Livestock-Fish Farming held from 19 to 25 November at Los Baños, Laguna, Philippines. Seated from left are Dr. Joseph C. Madamba, director of the SEAFDEC Institute of Aquaculture; Dr. Carson Kung-Hsien Wu, director of the Food and Fertilizer Technology Center of the Asian and Pacific Council; and Dr. Elvira O. Tan, PCARR fisheries research director.

Integrated farming

(from p. 3)

Return of Pla Nile in Combination with Pigs

Results of the survey from 3 farms at Soi Sena Nikom 1, Pahol Yothin Road, Bangkhen, Bangkok, Thailand are shown in Table 4 (p. 7).

Conclusion

From the data, the conversion rate of the excrement from one pig is roughly 31.00-55.55 kg of fresh fish. This type of fish culture is an effective way to utilize all of the waste materials to ensure constant income. Therefore, integrated farming is certainly better than raising only either livestock or fish.

The number of Thai fish farmers who have adopted integrated farming system is increasing. The system, however, could still be improved to get the highest income at the lowest cost.

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Table 3. Yield According to Research Results on Fish/Pig Raising

Fish Species	One Rai Pond		
	Initial wt. (gram)	Fish rearing period (month)	Yield (kg.)
Tilapia nilotica	30	6	600
Pangasius sutchi	2.0	14	400
Puntius gonionotus	2.5	10	500
Aristichthys nobilis and	100	6	200
Tilapia nilotica	30		400

Integrated fish farming in Thailand

by Somsak Janesirisak*

About 23,568 ha distributed in 20,974 farms are used for fish culture in Thailand. Thai fish farmers are now using modern technologies enabling them to produce a high fish yield. One such technology is the spawning techniques to induce fishes like chinese carps, to spawn. This enables farmers to produce more fingerlings than they need. Excess fingerlings are sold to other farmers.

The Thai farmers' critical problem is capital because feed is expensive. To reduce the cost of feed, they have come up with the method of integrated farming. Instead of raising fish only, they also grow livestock such as pig, chicken and others. Excrements of these animals are directly utilized by fish or used to enrich the pond for the growth of natural fish food organisms. Moreover, fish farmers usually grow crops such as banana or coconut trees on the dikes of the pond for more income.

Advantages of Integrated Farming

1. Integrated farming reduces the high cost of feed. There is no need to give additional fish food because fish utilizes directly the waste products from the animals staying over the pond. The excess waste materials can also cause the growth of phytoplankton and zooplankton. It was found that about 60% of the daily consumption of the pig is excreted as feces and urine. Therefore, fish can directly consume it and the valuable nutrients that these contain cause the growth of natural food organisms. (Table 1).

2. All areas in this type of farming will be utilized for maximum yield and production. Pens will be built over the fish pond or near the edge of the pond. Economic plants such as banana, coconut trees will be grown near by for more profit.

Building of Pens

There are two popular ways of building the pen in Thailand:

1. Those of wood or bamboo built over the fish pond in such a way that animal excrements fall into the pond.

2. Pens are built on the edge of the pond, with concrete floor sloping down towards the pond. This is more expensive than the first one.

Table 1. Chemical composition of pig excrements

Components	From 100 kg of Excrement Weight (kg)
Water	71.0
Organic matters	25.0
Nitrogen	0.5
Phosphorus ($P^2 0_5$)	0.4
Potassium ($K_2 0$)	0.3
Calcium	0.09
Others	

Adapted from Woynaronich (1976)

Steps of Management

1. General practices of preparing the pond must be done. Lime should be sprinkled on the pond to control parasites. After one week of raising livestock, fish can be stocked in the pond.

2. The water level should be kept at no less than 75 cm.

3. Pens should be cleaned every day or at least five times a week so that food scraps and animal excrements may fall into the pond.

Culture Species

The following are a few species which the farmer may raise in the ponds in combination with livestock:

Thai name	Common name	Scientific name
Pla nile	Nile	*Tilapia nilotica*
Pla song	Bighead carp	*Aristichthys nobilis*
Pla Tapien	Puntius	*Puntius gonionotus*
Pla swai	Catfish	*Pangasius sutchi*

Rate of Stocking Fishes and the Number of Animals

To get rid of water pollution and to maintain sufficient fish food organisms, it is necessary to know the rate between the species of fish and the number of animals to be raised in combination.

In Thailand, farmers prefer to culture fish with pigs. Some researches in this area were conducted by Extension Unit of the National Inland Fisheries Institute (NIFI), Bangkok, Thailand. The results are summarized in Table 2.

Table 2. Number of pigs and fishes in one Rai pond (0.16 ha)

Species of Fishes	One Rai Pond	
	No. of Pigs	No. of Fishes
1. *Tilapia nilotica*	7 - 10	1,600
2. *Pangasius sutchi*	10	1,000
3. *Puntius gonionotus*	8	4,000
4. *Aristichthys nobilis* and *Tilapia nilotica*	7	150 1,600

Some general guides and cost est for a small-scale prawn culture p

(Third and last in a series)

The last 2 previous issues gave the description of and cost estimates for establishing and operating the broodstock/hatchery system and the nursery system.

This issue gives the capital and operational costs for the grow-out pond systems as well as an economic analysis of the grow-out pond.

COST OF PHYSICAL FACILITIES & EQUIPMENT FOR GROW-OUT POND SYSTEM

I. Capital Outlay for Grow-out Pond

Cost of pond development

1.	Pond construction (dikes, canals, excavation/ levelling, reservoir, etc-1.2 ha at ₱40,000/ha ₱48,000.00	₱ 48,000.00
2.	Water facilities	
	1 unit main CHB gate ₱30,000/unit	30,000.00
	2 units wooden control gate ₱4,000/unit	8,000.00
	8 units wooden pond gate ₱4,000/unit	32,000.00
2.	Caretakers cottage 3 units at ₱10,000/unit	30,000.00
		₱ 148,000.00

II. Operational cost of grow-out ponds/yr (2 crops/yr; 1.2 ha)

1.	Labor/Services – caretakers/laborers		₱	1,800.00
2.	Sugpo juveniles	48,000 pcs		16,800.00
3.	Lime	6 tons ₱ 3,000		3,000,00
4.	Fertilizers (C.M. & Inorg. fert)	1,000		2,000.00
5.	Supply feed	1.6 tons ₱ 5.00/kg		8,000.00
6.	Maint/repair	₱ 1,000/ha		1,200.00
7.	Supplies/materials	2,000/ha	₱	2,400.00
8.	Depreciation			4,000.00
9.	Land lease			1,000.00
10.	Miscellaneous			1,000.00
11.	Overheads			1,400.00
			₱	42,600.00

Cost of production in grow-ou

A. *Cost of Production/ha/yr* (2 optn/yr)

Items

1. Labor/services
   a. Regular (1 caretaker & 1 asst/10 ha)
   b. Contractual (100 man days & 70 man days at ₱12.00/day)
2. Stock requirement
   a. Sugpo juveniles (40,000 & 10,000 at ₱.35)
   b. Bangus fingerlings (6,000 at ₱0.30)
3. Lime & fertilizers
4. Supply feed
5. Fuel/oil
6. Maint/Repair
7. Supplies/Materials
8. Land lease
9. Depreciation (pond dev.)
10. Overheads (5% of prod. cost)
11. Miscellaneous

B. *Returns from Grow-Out Ponds*

1. Mono (prawn) $\frac{40{,}000 \times 60\%}{20 \text{ pcs/kg}}$ x ₱4
2. Mono/poly $\frac{10{,}000 \times 60\%}{20 \text{ pcs/kg}}$ x ₱4

   $\frac{6{,}000 \times 90\%}{3 \text{ pcs/kg}}$ x ₱
3. Mono (bangus) $\frac{7{,}000 \times 90\%}{3 \text{ pcs/kg}}$ x ₱

timates roject

t ponds and expected returns

	Mono	Poly/Bangus
	₱ 960.00	₱ 960.00
	1,200.00	840.00
	14,000.00	3,500.00
		1,800.00
	2,000.00	2,000.00
	8,000.00	2,000.00
	500.00	300.00
	500.00	400.00
	600.00	400.00
	1,000.00	1,000.00
	4,000.00	3,000.00
	1,688.00	850.00
	1,000.00	800.00
	₱ 35,488.00	₱ 17,850.00
say	₱ 36,000.00	₱ 18,000.00
ɔ/kg = ₱48,000.00		
ɔ/kg		₱ 12,000.00
5/kg		9,000.00
	₱ 48,000.00	₱ 21,000.00
5/kg		₱ 10,500.00

Edible crustaceans in the Philippines

12. Cardisoma carnifex (HERBST)

English name: Land crab.
Philippine name: Kuray (Ilongo), Kagang (Cebuano) or Ungkong (Cebuano).

The carapace length can attain some 5 cm (scale shows 10 cm). Carapace is markedly convergent posteriorly: the dorsal surface is thickly covered with a pavement of microscopic granules. The posterolateral surface is only poorly striate. The chelipeds are asymmetrical.

The big chelipeds and mouth parts are dark purple and carapace is dark brown in color. Carpopodus, protopodus and dactylopodus of four pairs of walking legs have coarse hair.

The species hides inside holes lined with mud, located in the mangrove swamps or mud-flats near river mouths. They are nocturnal, hence, emerge from the hiding places at night or sometimes on rainy days to find food.

As of now there is no known professional method of fishery to catch this crab.

It is distributed from southern Japan, Formosa, Celebes to Tahiti, Tuamotu, Timor, Andamans, Mozambique and Durban.

This land crab is utilized as food by the people in rural areas.

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* by H. Motoh; 12th in a series.

R & D NOTES

Cage culture of tilapia in the Philippines*

The Philippines has vast freshwater resources suitable for the culture of fish. There are about 250,000 hectares of lakes, rivers, and reservoirs in the country that could be tapped for the production of fish in floating cages.

Although experiments on the cage culture of *Tilapia nilotica* in Laguna Lake were conducted as early as 1973, commercial production of *Tilapia mossambica* in floating cages in Lake Bunot, a small freshwater lake in San Pablo City in Southern Luzon, was started by the private sector in 1975.

Four species of tilapia are cultured in the Philippines. These introduced species are *Tilapia mossambica, T. nilotica, T. zillii* and *T. aurea.* While experiments on the cage culture of *T. zillii, T. nilotica, T. aurea* and tilapia hybrids have been conducted, only *T. mossambica* is commercially grown in cages at present.

Floating Cages

The commercial floating cage used in Lake Bunot for *T. mossambica* is constructed of locally-available materials such as bamboo, wood and nylon netting (12.7 mm mesh). A 50 x 25 x 5 m cage is estimated to cost ₱15,000 (US$2,000).

The 1 m^3 cage used for *T. nilotica* is made of wooden frame with polyethylene netting (25 mm mesh) and styrofoam floats. Each cage costs about ₱75 (US$10).

Management of Cages

T. mossambica grown in the commercial cages of Lake Bunot is stocked at densities as high as 100,000 fingerlings per cage or 16 fingerlings/m^3. The fingerlings weigh 5-10 g each on the average. The fish mainly subsist on the natural food in the lake. Rice bran is occasionally given as supplemental feed. Harvest is done every six months with yields of 10-15 tons per cage being reported. Marketable size of the fish is 100-150 g.

Cages with *T. nilotica* are stocked with densities of 250-1,000 fingerlings/m^3. The stocking size ranges from 5-20 g per fish. An artificial feed in moist pellet form consisting 23% fish meal and 77% rice bran is fed to the fish at the rate of 5% of the body weight per day. The feed costs ₱1.26 (US$0.17) per kilograms and has a mean conversion ratio of 2.5. The fish reach marketable size of 80-100 g in 2 to 4 months depending on the size at stocking and density. Production of 24-40 kilograms per cage every two months are attainable.

Economic Analysis

The two systems of cage culture for tilapia described appear to be highly profitable. A net income of ₱25,000 (US$3,378) per cage in six months in Lake Bunot with *T. mossambica* has been reported. Cage culture of *T. nilotica* in the experimental cages is also economically viable with an estimated net income of ₱50-80 (US$6.75-10.80) per cage per month.

Prospects and Problems

With the cage culture of tilapia proving to be a lucrative enterprise in the Philippines, a rapid expansion of the industry is expected. In fact, the number of cages in Lake Bunot alone has increased to more than 70 within 3 years. Cage culture of tilapia is also now being done in Laguna, Lake, Lake Paoay and the Pantabangan Reservoir, all in the island of Luzon.

The main problem faced by the tilapia cage culture industry in the Philippines is the shortage of fingerling supply. There are only a few commercial hatcheries in the country that can supply sufficient quantities of quality fish seeds. Others problems reported in some areas are poaching and marketing.

Tilapia cage farming

*From the paper presented by R.D. Guerrero III at the International Conference on Cage and Pen Culture, SEAFDEC Aquaculture Department, February 1979. The conference was sponsored by IDRC and the Aquaculture Department.

Chaudhuri joins FAO

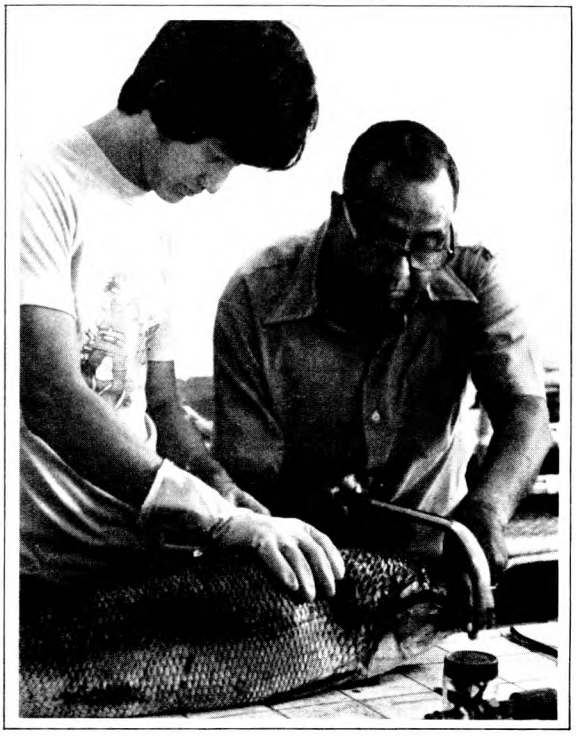
World-renowned Indian aquaculture scientist Dr. Hiralal Chaudhuri has resigned his post in the Aquaculture Department of SEAFDEC for an assignment as project coordinator of an FAO/ UNDP sponsored aquaculture development project in LAO People's Democratic Republic.

Dr. Chaudhuri served SEAFDEC as the regional aquaculture coordinator for the three years he had been with the organization and was deputy director for the Asian Institute of Aquaculture since June 1978.

His work on the induced breeding and culture of Indian major carps greatly enhanced the propagation of this fish in India. He also did pioneering work on techniques to mass produce seeds of Exotic Chinese carps, improved nursery management for carps, and induced breeding of grey mullet. The technique he developed for induced breeding of carps by injection of pituitary hormones has contributed substantially to the advancement of Indian as well as global aquaculture. Chaudhuri was for 12 years the administrative head of the Central Inland Fisheries Research Station in Cuttack. At the Aquaculture Department of SEAFDEC, he coordinated research in aquaculture among the SEAFDEC member countries and prepared and evaluated plans and programs for coastal aquaculture. He also in large measure helped in the experiments at induced breeding of milkfish.

As deputy director of the Institute of Aquaculture, Chaudhuri was in charge of the technology verification program of the institute. He also served as faculty member of the University of the Philippines-SEAFDEC graduate program in aquaculture. Chaudhuri's contribution to aquaculture science and technology may be gauged from his more than 70 scientific and technical publications he has come up with since 1951.

His forwarding address: *H. Chaudhuri, Project Coordinator, UNDP/FAO Aquaculture Development Project LAO/78/014 c/o UNDP, B.P. 345, Vientiane, LAO PDR.*



Dr. H. Chaudhuri preparing to dissect a sabalo at the SEAFDEC Aquaculture Department Laboratories. He is being assisted by one of the advisees at the University of the Philippines SEAFDEC graduate program in Aquaculture.

Integrated farming system... *(from p. 2)*

Table 4. Returns from culturing *Tilapia nilotica* in combination with pigs at Soi Sena Nikom 1, Bangkhen, Bangkok, Thailand.

Details	Farm No. 1	Farm No. 2	Farm No. 3
Pig			
No. of Pigs	45	100	100
wt. (kg)	8-10	8-10	8-10
Cost of young pigs (Baht)	20,250	50,000	50,000
Feed and Medical care (Baht)	26,311	19,720	44,500
Rented Area (Bath)	–	6,000	–
Period of raising (month)	7	8	8
Total wt. (kg)	8,400	11,000	12,000
Average wt. (kg)	120	110	120
Price (Baht/kg)	18	18.50	–
Total income (Baht)	97,200	203,500	228,000
Pla Nile			**Nile**
Area of pond (Rai)	4	6	10
Number of fish	15,000	25,000	200,000
Cost of fingerlings (Baht)	1,500	1,250	10,000
Fish rearing period (month)	6	6	7
Total wt. (kg)	2,500	3,100	5,000
Average wt. (kg)	0.250	0.250	0.100
Price (Baht/kg)	8	8	6
Total income (Baht)	20,000	24,800	30,000
Grain total income (Baht)	117,000	228,300	258,000
Grain expense (Baht)	48,061	136,970	204,500
Profit (Baht)	69,139	91,330	53,500

Ready short course on aquaculture business project development and management

Plans and preparations for a seminar-workshop on aqua-business project development and management are underway. The course has been tentatively scheduled to be held in March next year. It is going to be a joint project of the SEAFDEC Aquaculture Department and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA).

Senior specialists from SEAFDEC and SEARCA as well as guest lecturers from the Asian Institute of Management, the University of the Philippines and from among the progressive aquaculture businessmen in the Philippines will lead the seminar session.

The course is designed to provide executives and staff members in aquabusiness companies, the financial community, and other aquaculture oriented institutions the management tools to increase their effectiveness in identifying, developing, implementing and evaluating projects in the aquabusiness sector. The project study framework involves the market, technical, and financial aspects. Skills to be learned are decision making, analyses, and planning. Major topics include project and opportunity identification, the concept of aquabusiness, managerial tools for developing and implementing project activities, and evaluation of the market, technical and financial feasibility of aquaculture-based projects. The course is being planned for a period of 14 days.

Send inquiries to:

The Head
Training Division
Institute of Aquaculture
SEAFDEC Aquaculture Department
P.O. Box 256, Iloilo City, Philippines

PCARR 7th Anniversary fete

Focus on social implications of science

The Philippines Science Development Board Chairman Minister Melecio S. Magno, guest speaker at the Philippine Council for Agriculture & Resources Researcher's seventh anniversary fete on November 28 this year, underscored the need for a dialogue between the scientists and those concerned with the problems of social development. The former have to know the problems of society, whereas the latter have to be aware of the benefits as well as the limitations of science in meeting these problems, he said.

Thus, PCARR focused on the social implications of science as its theme for its anniversary.

PCARR took a long hard look at itself in a pre-anniversary symposium "Looking at Ourselves From the Inside" held on November 26-27. The symposium served as venue for research directors who reviewed the thrusts and activities of their respective divisions. It will be a forum for the discussion of issues pertaining to areas that bear directly on PCARR in its role in upgrading and sustaining research capability.

PCARR was established by President Marcos on November 10, 1972 to coordinate all research activities on agriculture, forestry and fisheries in the Philippines. PCARR has since then embarked on a massive research capability development program which has turned out new research facilities and better manpower for the national network of research centers and stations.

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