

The aquaculture training needs in the Philippines and Southeast Asia

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Expansion of the aquaculture industry is not possible without appropriate training of technicians, administration personnel, extensionists, and small-scale fishers. With increasing investment in aquaculture, we need to develop sufficient and self-reliant aquaculture manpower.

Training at the college or university level is limited, and can not meet the increasing need for technical skills in aquaculture especially those pertaining to hatchery operations, culture systems, and disease control. Increased demand for aquaculture products, rapid technology development, and the need to transfer technology have justified the conduct of short-term specialized training courses.

AQD has grown into one of the largest and best equipped aquaculture institutions in Asia. The research-based knowledge that AQD accumulated is aimed at improving aquaculture technologies and providing the necessary background data for academic training of aquaculturists in the region. AQD has trained more than 6,500 government workers and aquaculture technicians and managers all over the world. AQD's activities have substantially improved technology transfer in aquaculture.

In order to improve its training programs, AQD assessed training requirements and available aquaculture manpower in Southeast Asia. This assessment is also a tool which AQD can use to respond to the region's actual training needs.

Methodology

A survey was conducted in collaboration with the regional and provincial offices of the Department of Agriculture - Bureau of Fisheries and Aquatic Resources (DA-BFAR) and selected fisheries schools and institutions in the Philippines and other southeast Asian countries. The respondents were requested to complete a questionnaire covering, in brief, aquaculture systems or practices, cultured and potential species for culture, availability of aquaculture manpower, and training areas most needed in their respective countries.

In addition, a tracer study of AQD's training alumni (1985-1993) was conducted to determine whether the knowledge learned and skills developed were put into practice.

Survey results

Table 1 shows the number of respondents. The respondents' assessment of the present status of aquaculture is that the industry is diversified, with different culture practices. Milkfish, carp, tilapia, and catfish are the dominant groups among the cultured fishes

TABLE 1 Number of respondents; total number of survey questionnaires mailed out in parenthesis

<i>SEAFDEC Member-Countries</i>		
Philippines	68	(90)
Brunei Darussalam	0	(1)
Malaysia	1	(2)
Singapore	1	(1)
Thailand	5	(6)
Viet Nam	0	(1)
	75	(101)
<i>Non Member-Countries</i>		
Bangladesh	0	(1)
Cambodia	1	(2)
China	1	(2)
Hong Kong	1	(1)
India	5	(9)
Indonesia	3	(10)
Myanmar	0	(2)
Nepal	2	(5)
Pakistan	0	(2)
Sri Lanka	1	(3)
	14	(37)
	89	(138)

followed by grouper, sea bass and snakehead. Shrimps, freshwater prawns and crabs dominate crustacean aquaculture while oysters and mussels dominate the mollusc group. Of the countries surveyed, only Singapore is engaged in ornamental fish culture. The Philippines, Indonesia, Thailand, Malaysia and China are engaged in seaweed culture, mainly *Euचेuma* and *Gracilaria*.

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What the alumni say about the AQD training courses



PHILIPPINES

courses must be regional in nature provincial-level technical officers must be given priority since they now work directly with fishfarmers more fellowship / study grants, perhaps one trainee per province or region for each course better screening of applicants, trainees must be knowledgeable; suggest not to accept a trainee that has attended more than one course in a year training of government workers should be free, and these trainees must have logistic (=equipment) support so that there is continuity in applying what they have learned



MALAYSIA

there is a need for networking / linking between training institutions for easy transfer of information



INDONESIA

training duration should be extended and more practicals included



THAILAND

seminar-workshops among countries is needed for the integrated development of the whole region



SRI LANKA

short study tours on aquaculture for officials; training of farmers in seed production needed



CAMBODIA

small-scale integrated systems are most appropriate to sustain increasing interest of rural communities



INDIA

staff exchange between countries on tropical mariculture should be considered



NEPAL

fellowships, scholarships needed



Several culture systems are used for some species. The most common are ponds, fresh- and brackishwater impoundments, and cages. Other culture systems include pens, tanks or raceways, and on-bottom and off-bottom (suspension) systems. Integrated farming and open-water or searanching are also practiced, while hatchery development appears to be the trend for seed production by artificial means.

The respondents were asked to predict future aquaculture expansion and developments within the next decade. The general perception is a trend towards intensification and transformation of extensive rural aquaculture practices to intensive and commercial aquaculture, less dependence on wild fry and more hatchery seed production (Table 2). Most respondent institutions also suggested an increase in culture areas. In countries with large rural populations and plenty of available land and water areas such as India, Philippines, China and Indonesia, the predicted trend is diversified development towards intensification, commercialization, and expansion of rural aquaculture practices. For respondents from highly industrialized countries like Singapore and Hong Kong, specific trends were toward the increase in culture areas or intensification of culture, and increased dependence on hatchery-bred fry. The respondent from Hong Kong and 36.8% of the respondents from the Philippines predicted continued reliance on seed supply from the wild for subsistence farming.

Priority short-term training needs of countries surveyed are shown in Table 3. All responses in countries with more than one respondent were pooled and ranked accordingly, because the number of respond-

TABLE 2 Specific trends in aquaculture expansion and development up to year 2000 as identified by respondents

	Philippines	Malaysia	Thailand	Singapore	Others
Increase in culture areas	48.5*	✓	20.0	✓	✓
Intensification of culture	86.7	✓	20.0		✓
Maintenance of rural practices / subsistence level	36.8		20.0		✓
Transformation of extensive rural aquaculture practices into intensive and commercial aquaculture	75.0	✓	100.0		✓
Increased dependency on hatchery fry supply	72.0	✓	60.0	✓	✓

*percentages from countries with more than one respondent, otherwise check marks are used

gered Asian dowitcher *Limnodromus semipalmatus*. Under the Debt-for-Nature-Swap Program, PAWB, the World Wildlife Fund, and the Haribon Foundation manage the El Nido Marine Reserve and St. Paul Subterranean River National Park in Palawan and the Mt. Pulog National Park in northern Luzon.

Urban parks and plazas

Biodiversity in urban areas must be protected for both utilitarian and aesthetic reasons: shade, cooling, noise abatement, pollution control, and architecture. The great

parks and natural areas of the world's major cities, such as Central Park in New York City and the Golden Gate Park in San Francisco, provide opportunities for recreation, relaxation, and education, as well as habitats for a wide variety of species. Less grand but also important, the Luneta National Park in Manila and the Ninoy Aquino Parks and Wildlife Nature Center and Quezon Memorial Circle provide millions of Metro Manilans respite from an overcrowded polluted existence.

Nayong Pilipino near the Manila international airport is mostly an architectural and cultural display, but also has an aviary, aquarium, fishing lagoon, and a

diverse plant collection. Nayong Pilipino is a good concept and a potentially stimulating urban park, but the commercial activity in the regional house replicas has not been regulated and several houses have degenerated into shabby shops and eateries. Instead of just selling souvenirs and food, the house replicas had better feature exhibits and descriptions of human life and the natural ecosystems in the different regions of the country. Funding can come from entrance fees, which will increase when more visitors come for educational and entertaining treats other than cheap

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ents from each country varied in terms of priority short-term training needs. Highest priority was given a value of 10 and lowest, 1. Short-term training is defined as that which requires "hands-on" training with a duration of 2 months or less.

The results of the survey indicate that all short-term training courses offered by

AQD were given high priority. In addition, training courses on aquaculture research and extension methodologies, integrated and intensive farming systems, management of aquatic resources and the environment, aquaculture economics and fish genetics were also deemed important.

In the Philippines, the survey indicates

that brackishwater aquaculture for fish and crustaceans has the highest demand until year 2000. This is followed by freshwater aquaculture, aquaculture management, and fish health management. There is also a need for short-term training on aquaculture research methodology, culture of natural

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TABLE 3 Ranking of priority short-term training needs

	PHIL	MALAY	SING	THAI	INDO	INDIA	CHINA	SRI	HK	CAM	NEPAL
Brackishwater Aquaculture	1		4	10	2	1		1	10	2	
Freshwater Aquaculture	2		4	7	6	8		2	9		2
Aquaculture Management	2	1	2	4	5	7	5	3	3	1	4
Fish Health Management	3	1	3	5	3	3	1	4	1	3	1
Aquaculture Research Methodology	4	1	4	3	9				8	2	4
Culture of Natural Food Organisms	5	1	3	2	4	7				2	3
Fish Nutrition	6		3	1	3	6	5	8	2	3	5
Marine Fish Hatchery	7		2	3	1	2	1	7	7		
Shrimp Hatchery Operations	7		5	6	7	4		6			
Aquaculture Extension Methodology	7		4	9		10		5	5	1	6
Integrated Fish Farming	8				10			9		1	
Fry Collection, Handling & Storage	9		5	9					4		
Sanitation and Culture of Tropical Bivalves			5	6	6	9			6		
Artemia Culture	10		3	8	8	5		10			
Management of Aquatic Resources & the Environment		1									7
Intensive Farming System			1								
Aquaculture Economics			2								
Fish Genetics			3								



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food organisms, fish nutrition, fish and shrimp hatchery operations, aquaculture extension methodology and integrated farming systems. In Southeast Asia, it is surprising that the Philippines and Thailand which are considered "aquaculturally developed", have high short-term training needs. Similar patterns of short-term training were reported by Sri Lanka and India, although freshwater aquaculture was of less importance. There is minimal short-term training need for respondent institutions from China, while India, Indonesia, and Sri Lanka have comparatively significant aquaculture training needs.

The general trend for internship training emphasized specific aspects of aquaculture as shown in Table 4. Feed formulation and preparation, fish disease diagnosis and marine fish broodstock and hatchery operations had the highest demand

in the Philippines and other Southeast Asian countries. Shrimp culture, and plankton culture, chemical/proximate analysis also showed high demands.

The Philippines, Thailand, Indonesia, and India had high requirements in nearly all internship training programs offered by AQD. Internship needs of Hong Kong were only on feed formulation and preparation and fish disease diagnosis. As its major export commodity is ornamental fish and due to limited manpower and available land areas for aquaculture, it is understandable that Singapore has no internship needs for specific aquaculture areas offered by the Department.

Table 5 shows the outreach/on-site seminars requested by the respondents from the Philippines. Requests varied from region to region. The highest demand was for feed formulation and preparation and fish disease diagnosis. Fishpen/cage culture of finfish, fish nutrition, seaweed culture and processing, mudcrab fattening in cages or pond culture, finfish broodstock

and hatchery operations and fish health management were also of high demand. For other SEAFDEC Member Countries, only Malaysia requested internship for fish health management and responsible and sustainable aquaculture. All other respondents from the non-member countries surveyed did not respond to the outreach/on-site seminar needs.

The respondents were asked about the capability of their institution or government agency in providing necessary funds for training and graduate education programs in aquaculture. The results show that 96-100% of the respondents from the institutions surveyed in the Philippines, Southeast Asia, and other countries indicated that scholarships, grants and fellowships are necessary. Only 4% of the respondents from the Philippines (Regions VII, IX, and XI) and Hong Kong and Singapore reported that funding sources are adequate, depending on the needs and the demands within their institutions (Table 6).



TABLE 4 Specific areas for in-service (or internship) requested at AQD by respondent countries

	PHIL	THAI	MALAY	INDO	INDIA	CHINA	SRI	HK	CAM	NEPAL
Feed formulation and preparation	75.9*	83.3		66.6	80.0	✓		✓	✓	100.0
Fish disease diagnosis	73.5		✓	100.0	80.0	✓		✓		100.0
Milkfish broodstock / hatchery operations	60.3	20.0		33.3		✓				
Shrimp culture	54.4	20.0	✓		100.0					
Plankton culture	50	40.0		66.6	20.0	✓				66.3
Sea bass broodstock / hatchery operations	49.4	20.0		66.6	40.0	✓				
Chemical/proximate analysis	45.6	40.0	✓	100.0	20.0					33.3
<i>Others:</i>										
Seaweed culture and processing	8.8				20.0		✓			
Grouper broodstock / hatchery operations	7.4			66.6						
Integrated farming									✓	
Marine fish hatchery	5.8	20.0							✓	
Catfish breeding and hatchery operations	5.8				20.0					
Aquaculture research methodology			✓						✓	
Aquaculture management			✓		20.0				✓	
Coastal zone management (study tour)		20.0								
Formulation and environmental policy (study tour)		20.0								
Mollusc / oyster / scallop				66.6	40.0		✓			
Aquaculture engineering							✓			
Aquaculture economics							✓			

*percentages from countries with more than one respondent, otherwise check marks are used

TABLE 5 Outreach / on-site seminars requested by respondents from the Philippines

Feed formulation and preparation
Fish disease
Integrated fish farming
Pen / cage culture of fish
Mudcrab fattening in cages on pond culture
Seaweed culture and processing
Fish nutrition
Fish broodstock and hatchery operations
Fish health management
Fry selection and supply
Fish farm management
Prawn hatchery
Sea bass / grouper broodstock and hatchery
Intensive milkfish culture
Financial assistance
Fry / fingerling production of tilapia and catfish
Freshwater prawn hatchery
Brackishwater aquaculture
Aquaculture management
Water quality management
Natural food production
Hatchery management
Pond engineering and economics
Post-harvest technology
Semi-intensive prawn culture

Tracer study

About 990 questionnaires were mailed out to training alumni who attended short-term courses conducted by AQD from 1985 to 1993. About 130 responded; 95 questionnaires were returned to AQD (Table 7).

Table 8 shows the classification of the respondents according to their affiliation. For the Philippines, 69 came from the government and 32 from the private sector. For other countries, there were 29 from the

government and one from the private sector.

Of the 101 respondents from the Philippines, 74% reported that the training courses they attended were given importance, 83% said that knowledge gained was applied, and 44% indicated that their incomes increased. For respondents from foreign countries, 79% said that their training was given importance, 77% said that knowledge gained was applied and 63% indicated that their income increased.

The respondents from the Philippines (17%) and foreign countries (23%) who reported that the knowledge and skills gained from the short-term training courses were **not** applied gave the following reasons:

Philippines

No support from management	19%
Assigned in other projects	81
Devolution	31
No fish health laboratory	6
No funds available	12
Area not suitable for hatchery	6
Lack of equipment / facilities	6
Assigned to help other family business	6
Family abandoned plan of establishing shrimp pond when CARP was implemented	6

Foreign countries

Transfer to another section	86%
Considered as study trip	14



TABLE 7 Number of training alumni attending AQD training courses, 1985-1993

Courses		Number of participants
Shrimp hatchery	(1985-1993)	341
Aquaculture management	(1990-1993)	63
Natural food	(1989, 1991-93)	33
Freshwater aquaculture	(1985-1993)	55
Pond culture	(1985-1993)	178
Marine fish hatchery	(1985-1993)	141
Fish health	(1987-1993)	96
Fish nutrition	(1989-1993)	63
Milkfish hatchery	(1990)	17
		987
Tracer study		
No. of questionnaires mailed out		987
No. of respondents		131
No. of questionnaires returned to AQD		95

TABLE 8 Classification of respondents by institutional affiliation

	Govt	Private	Total
Philippines	69	32	101
Other countries	29	1	30
	98	33	131

TABLE 9 Percent of respondents given recognition after AQD training

	Philippines		Other countries	
	Yes	No	Yes	No
Training given importance	74	26	79	21
Knowledge applied	83	17	77	23
Income increased	44	56	63	37

TABLE 6 Capability for staff development

	PHIL	THAI	MALAY	SING	INDO	INDIA	CHINA	SRI	HK	CAM	NEPAL
Funding sources are adequate	4.0*	0.0		✓					✓		
No funds available											
Scholarships, grants and fellowships are necessary	9.6	100.0	✓		✓	100.0	✓	✓		✓	100.0
Trainees can finance themselves											

*percentages are for countries with more than one respondent, otherwise check marks are used