

# Institutional Capacity Development for Sustainable Aquaculture and Fisheries: Strategic Partnership with Local Institutions

Renato F. Agbayani and Joebert D. Toledo\*

*Aquaculture Department  
Southeast Asian Fisheries Development Center (SEAFDEC)  
Tigbauan, Iloilo 5021, the Philippines*

\*E-mail: [jdtoledo@seafdec.org.ph](mailto:jdtoledo@seafdec.org.ph)

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Many people living in the rural areas in the Philippines, as in other developing countries in Southeast Asia, depend on aquatic resources for their food and livelihood. For the past two decades, the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC-AQD) has been working with fishing communities and people's organizations, business sector, local government units, national government agencies, non-government organizations (NGOs) and academic and other research institutions to promote the efficient conservation, management and sustainable development of the country's fisheries and aquatic resources so that these may continue to serve the needs of the people today and tomorrow.

Using the lessons learned from those two decades of multi-sectoral and inter-disciplinary collaborations, SEAFDEC-AQD launched in late 2006 a project called Institutional Capacity Development for Sustainable Aquaculture (ICDSA) to hasten the transfer to and adoption by coastal villagers of appropriate technologies that would enhance the productivity of aquatic resources and at the same time safeguard the fragile balance of the aquatic ecology.

The experience of SEAFDEC in coastal resource management shows that it is important to engage the collaboration of the local government units and other "on-the-ground" institutions, such as NGOs and people's organizations, to be able to introduce effectively any social and technological interventions to target community-beneficiaries. However, before a fruitful collaboration among these institutions could be attained, there is a need to build their capacities, and those of the beneficiaries, for the vital roles that they play in the implementation of livelihood projects and environmental management programs.

As of January 2008, SEAFDEC-AQD is implementing ICDSA projects in four provinces—Antique, Capiz, Guimaras and Northern Samar in central Philippines. In the pipeline are similar projects for a province in southern Philippines and two provinces in the north.

**KEYWORDS** capacity building; aquatic resources management; sustainable aquaculture; Malalison, Phillipines

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## 1. Introduction

The aquatic resources of the Philippines provide food and livelihood to some millions of Filipinos in rural areas of the archipelago. As in other Southeast Asian countries, the Philippines' fishery resources have suffered alarming degradation due to overfishing to meet the demands of the burgeoning population, destructive fishing methods, industrial and domestic effluents, and irresponsible aquaculture practices. In response to warnings from different sectors since the mid-1960s, the Philippine government enacted laws and made policies for the protection, conservation and sustainable development of the country's fisheries and aquatic resources.

Two landmark legislations that have significantly supported the aquatic resources development thrust of the Philippines are Republic Act (RA) 7160, known as the Local Government Code, and RA 8550, the Fisheries Code of the Philippines. The Local Government Code sets the legal framework for the democratic decentralization—from the national executive branch of government to local government units (LGUs), i.e. provincial and municipal levels of government—of decision-making, planning and implementation of development programs, and promulgation and implementation of local ordinances in support of local development goals. The Fisheries Code spells out the government's goals and policies regarding fishery resources, and unequivocally states that LGUs plan and implement their own fisheries development programs, and calls for the empowerment of people's organizations (POs) to manage, conserve and protect, develop and utilize fishery resources within municipal waters (15 kilometers from shoreline). The LGUs shall grant demarcated fishery rights to fishery organizations/cooperatives for mariculture operation in specific areas.

The Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC-AQD), mandated to promote and undertake aquaculture research and development (R&D) relevant to Southeast Asia, has been collaborating during the past two decades with LGUs, POs, non-government organizations (NGOs), national government agencies, business sector, and academic and research institutions on community-based coastal resources management projects that foster the sustainable development and responsible utilization of fishery resources. Its mission is to provide dynamic and competent leadership in the generation of science-based technologies in order to strengthen stakeholder capacities in aquaculture and aquatic resources management.

From its experience, SEAFDEC-AQD has seen that the success of social and technological interventions to ameliorate the people's lives and conserve aquatic resources hinges on a strong collaboration among the stakeholders—the LGUs, concerned national government agencies, legislative and policymaking bodies, beneficiary-communities, POs, NGOs, fund donors, and academic and R&D institutions. Strong collaboration is dependent on the capacity of the different institutions to perform their roles in support of the projects.

A community-based development model provides for the return of the decision-making to the people and recognizes their abilities to manage the resources needed to meet their needs (Agbayani and Babol 2001). This development model requires the transformation of the community institutions to enable them to manage and control resources in response to local needs and preferences (Korten 1988). In an emerging paradigm shift of community-based resource management or co-management in a broader sense, the role of local government is to facilitate the development process through empowering and capacity building of local institutions.

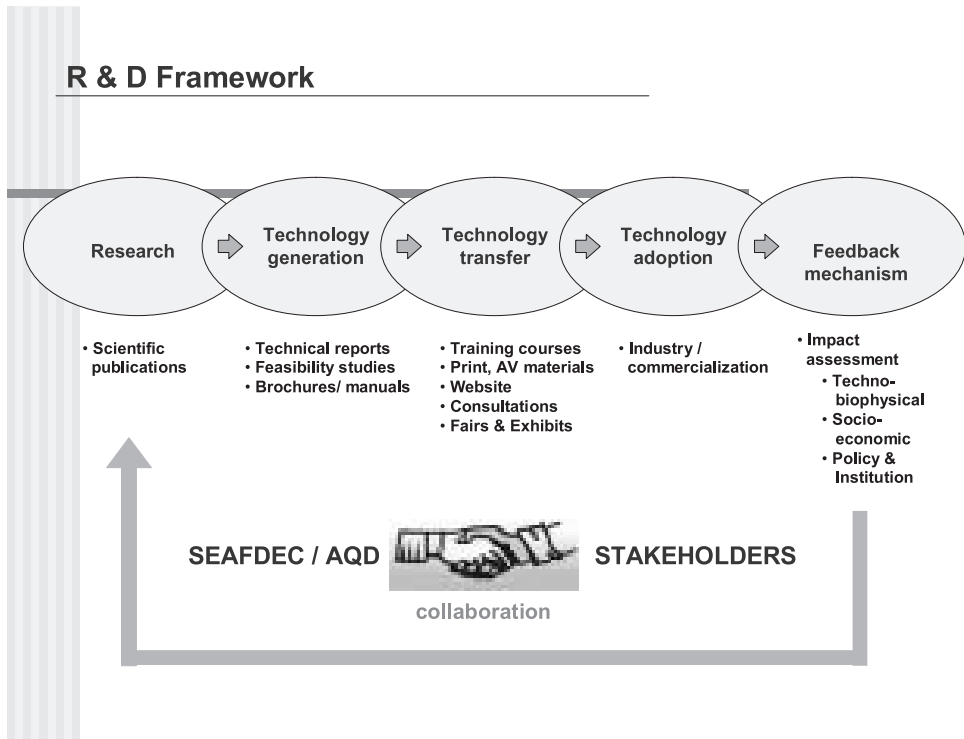


Fig. 1. SEAFDEC R&D framework

## 2. SEAFDEC-AQD R&D Framework

Figure 1 demonstrates SEAFDEC-AQD's R&D Framework (Agbayani *et al.* 2007). It integrates aquaculture research and development in a cycle of activities that is based on a strong collaboration between SEAFDEC-AQD and the different fishery resources stakeholders such as fishing communities, fishing and aquaculture business sector, LGUs, national government agencies, legislative and policy-making bodies, academic and research institutions.

### Research, Technology Generation:

Strong science is the foundation of technology generation. Aquaculture technologies generated by SEAFDEC-AQD are the results of years of painstaking research done by scientists and technologists whose work have

been published in international, peer-reviewed scientific journals.

### Technology Transfer, Technology Adoption:

Technologies generated by SEAFDEC-AQD go through commercial-scale runs to evaluate their technical and economic feasibility, and fine-tune them for eventual dissemination to end-users. After successful trial runs, information about the technologies is disseminated through the popular media, and how-to manuals and brochures are prepared for clients.

Farm demonstrations and training courses are conducted either at SEAFDEC-AQD facilities or on-site, whichever is more convenient to technology users.

### Technology Impact Assessment:

Aquaculture technologies are assessed in terms of their techno-biophysical and

economic feasibility, social acceptability, and implications on institutional arrangements.

**SEAFDEC-AQD Collaboration with Stakeholders:** Throughout the R&D process, SEAFDEC-AQD maintains regular consultation and dialogue with stakeholder-collaborators to ensure the effective transfer of technology and information, and the accuracy of impact assessment.

### 3. The Malalison Experience: Community-based Fishery Resources Management

SEAFDEC-AQD's experience in working with fishing communities, LGUs, NGOs and POs started with an eight-year (1991–1998) community-based fishery resources management (CFRM) project on Malalison Island, Culasi, Antique Province, in central Philippines. The success of this project has made it a model for other CFRM projects in other parts of the country (Agbayani *et al.* 2000).

#### 3.1. Background and objectives

The CFRM Project, funded by the International Development Research Center (IDRC) of Canada, was implemented by an interdisciplinary team of biologists, socioeconomists, social workers, engineers and aquaculture technologists. The project objectives were to: 1) develop the community into a strong organization that could manage its fishery resources; 2) teach livelihood skills to the fisherfolk and provide them capital to start livelihood projects; and, 3) regenerate fish habitats and increase fish stocks.

Biological and socioeconomic surveys were conducted in 1991–1992 to determine the people's preparedness to receive such interventions. Significant findings are presented below:

Malalison's municipal waters were fished by both the island's residents and those from other communities. The dominant fish

species caught were fusilier, surgeonfish, snapper and grouper. Dynamite and cyanide fishing were rampant despite the national laws banning and penalizing these destructive practices because of inconsistent law enforcement. The coral reefs were degraded and their fish yield was a low 5.8 tons/km<sup>2</sup>/yr (Amar *et al.* 1996).

The socioeconomic survey revealed that 98% of the Malalison residents depended on marine resources surrounding the island for their food and livelihood; 93% had an income below poverty level (Agbayani and Siar 1994). The islanders generally had low educational attainment: most had only four-six years elementary schooling with a few reaching high school level.

The islanders had an informal and unregistered organization called MICA (which stood for the island's location address; Malalison Island, Culasi, Antique) that coordinated community efforts mainly for the celebration of the annual feast day of their patron saint.

#### 3.2. Capacity-building and social reform: preparations for socioeconomic, environmental and policy interventions

The findings of the surveys showed the need for capacity-building and social reforms to prepare the islanders for socioeconomic, environmental, and policy interventions. SEAFDEC-AQD, in close coordination with the village leaders conducted consultations with the islanders to determine the training needs and social reforms to be advocated.

##### 3.2.1. Community empowerment through knowledge and skills training

SEAFDEC-AQD engaged the services of an NGO (PROCESS Foundation) as partner in the social preparation and values formation of the islanders. Starting in 1992, PROCESS conducted training courses on organizational development and management, cooperative development and management, financial management, environmental protection,

gender sensitivity, hog-raising, entrepreneurship development, project management, and funds accessing and sourcing. PROCESS also conducted seminars on para-legal work, lobbying and advocacy, and on the provisions of the Local Government Code on fisheries management.

### 3.2.2. Study-tours of potential models for development

SEAFDEC-AQD also brought the village leaders on a study-tour of coastal barangays in different provinces whose initiatives could serve as Malalison's examples for development.

### 3.2.3. Formal organization for formal link and community action

One important social preparation was the establishment of a formal organization for the community: the Fishermen's Association of Malalison Island (FAMI). Registered with the Securities and Exchange Commission in 1992, FAMI served as the formal link between SEAFDEC-AQD and the community and the platform for community action. Calls for community dialogues on contentious issues and consultations on the Project's activities were channeled thru FAMI.

FAMI also functioned as a cooperative, thus, the CFRM Project released thru FAMI loans for alternative livelihood such as hog- and poultry-raising, a cooperative store, and seaweed farming (Hurtado-Ponce 1992; Hurtado *et al.* 1998).

FAMI, guided by the Project, hosted dialogues on how to assert the islanders' rights over their territorial waters and protect their fishery resources from further destruction due to illegal fishing. They prepared resolutions asking their town council, through their barangay council to grant them territorial use rights in fisheries (TURF), declare a reef area as fish sanctuary, and approve the deployment of concrete artificial reefs (ARs) near their island and allocate an amount from their barangay funds to help defray costs for the deployment.

## 3.3. Project milestones

The following are the milestone achievements of the Malalison CFRM Project:

### 1) *Granting of TURFs:*

With TURF granted by Municipal Ordinance 5-90, the FAMI members were given the rights to and responsibility for the proper utilization, management and control of the territorial waters of their island.

### 2) *Declaration of a fish sanctuary*

With technical advice and scientific data provided by SEAFDEC-AQD, the islanders chose the Guiob reef area to be declared as a fish sanctuary. The area was a major fishing ground for the islanders; it is the habitat of various fish species that needed to be conserved; and it is near enough for surveillance purposes.

### 3) *Construction and deployment of concrete artificial reefs*

The ARs were designed and constructed by SEAFDEC-AQD engineers. They were used for coral reef regeneration, and not for fish aggregation. These were deployed in 1995 in two coral reef areas—Guiob and Kawit—with 26 modules per area (Tenedero 1995).

### 4) *Creation of the Fisheries and Aquatic Resources Management Council*

In accordance with the Local Government Code, the islanders formed a Fisheries and Aquatic Resources Management Council (FARMC) in June 1995. FARMC's functions are to: 1) prepare fisheries management plans and policies based on scientific assessment and socioeconomic considerations; and, 2) recommend to this local government and concerned national government agencies the issuance of permits for the appropriate use of fishery resources.

### 5) *Use of scientific data in support of fish sanctuary*

The value of scientific data for policymaking was demonstrated when the

town council approved the declaration of a fish sanctuary based on the data provided by SEAFDEC-AQD.

6) *Municipal Council approval of the declaration of a fish sanctuary*

The declaration of a fish sanctuary by the Culasi Municipal Council was a first in the province of Antique, and is considered as a groundbreaking initiative.

7) *Multiplier effect of the Malalison CFRM*

The Malalison CFRM project “spawned” 14 fish sanctuaries in the municipality of Culasi and in three nearby municipalities—Sebaste, Pandan and Libertad. Two unified coastal resources management councils were also established, patterned after the Malalison model. The first is the LIPASECU (Libertad, Pandan, Sebaste, Culasi) Council which was organized to coordinate and oversee the planning and implementation of an integrated coastal resources management in the four municipalities. The second is the Banate Bay Coastal Resources Management, Inc. which was established to coordinate and integrate the management and development of four coastal municipalities in the adjacent province of Iloilo.

8) *Enhancement of SEAFDEC-AQD training courses*

SEAFDEC-AQD’s training courses were enhanced by the incorporation of topics on community-based coastal resources management. Most information incorporated in the lectures were from the Malalison experience.

9) *Impact assessment*

Fish landings. Fish landings on Malalison Island were monitored during June 1995–1997 to determine the species composition of catch, catch per unit effort and yield from different fishing areas. Reef and reef-associated fish yield was estimated at 22.44 tons/km<sup>2</sup>/yr. This was almost four-fold increase from the 1992 estimate of 5.8 tons/km<sup>2</sup>/yr. (Primavera, 2002).

Policy dialogue and development. The concept of TURF was acceptable to the fishers and was perceived as beneficial to them (Siar *et al.* 1992).

Resource co-management strategy. A case study revealed that fishery resources co-management was perceived to be successful based on the criteria of social equity, management efficiency and environmental sustainability (Baticados and Agbayani 2000).

## 4. Institutional Capacity Development for Sustainable Aquaculture

### 4.1. Background and rationale

The success of the Malalison project enabled opportunities for SEAFDEC-AQD to reach out to various stakeholders in other provinces.

Using lessons from the Malalison CFRM Project and guided by its R&D framework, SEAFDEC-AQD launched in mid-2006 a project called Institutional Capacity Development for Sustainable Aquaculture (ICDSA). The first project site is located in the province of Antique, in central Philippines. The next three are located in the provinces of Guimaras, Capiz and Northern Samar, all in central Philippines.

The project is based on the belief that strong collaboration among stakeholders underpins the effective introduction of social and technological interventions to improve the socioeconomic conditions of the people and promote the efficient management and sustainable development of natural resources. Strong collaboration may only be achieved if the stakeholders have the capacities to perform their share in communal initiatives.

The overall goal of ICDSA, therefore, is to build the capacities of aquatic resource users by providing them with knowledge and skills to become responsible resource managers and users.



ICDSA's specific objectives are to: 1) build the capacity of LGUs, community-based organizations, non-government organizations, fishery schools and other on-the-ground institutions for the practice of sustainable aquaculture; 2) demonstrate the technical and financial feasibility of aquaculture technologies in project sites; 3) ensure the sustainability of aquaculture as a livelihood for small-scale fishers; 4) provide stakeholders with scientific information on aquaculture and aquatic resources; 5) assess the Project's contributions to the improvement of the socioeconomic well-being of fishing communities, impacts on the aquatic ecology, and influence on local legislation for effective governance of aquatic resources; and, 6) evaluate the effectiveness of mechanisms for the transfer and adoption of aquaculture technologies.

## **4.2. Project strategies**

### **4.2.1. Community-based and co-management approaches**

SEAFDEC-AQD makes it a pre-requisite for its ICDSA projects that target beneficiary-communities are organized and are made responsible for the proper management and utilization of their aquatic resources. But for them to become efficient co-managers, they must possess the knowledge and skills for the job.

SEAFDEC-AQD conducts a rapid social assessment to establish a socioeconomic database of the community. The survey includes socio-demographic profile, income and livelihood options, and involvement in community activities, including resource management and conflicts resolution. The survey, together with community consultations, determines the social and technological interventions to be introduced and the social preparations needed for the effective introduction of such interventions.

Social preparation is critical in the success of community-based resource management and livelihood projects. NGOs and aca-

demical institutions are usually engaged to conduct seminar-workshops on basic environmental protection and management, organizational development and management, cooperative management, basic accounting and bookkeeping, gender-sensitivity awareness, lobbying and advocacy, fund accessing and sourcing, and basic laws and ordinances that have to do with the development and utilization of common properties.

### **4.2.2. Formal partnership with local institutions**

For ICDSA projects, SEAFDEC-AQD enters into formal partnership with LGUs and other concerned government agencies, NGOs and POs. A Memorandum of Agreement defines the partnership's terms of references, and the roles and responsibilities of the parties involved in the project.

The budget for the project implementation is provided by a client (LGU, NGO, PO). It is either sourced internally (as in the case of LGUs) or from a donor. SEAFDEC-AQD normally shoulders expenses for pre-project activities, such as transportation, accommodation and incidental expenses of scientists and technical staff who conduct pre-project surveys needed in the project proposal preparation.

## **4.3. Project activities**

Training, technology demonstration and research are the three main activities of ICDSA projects. The ICDSA projects, in effect, become: 1) an R&D platform for the demonstration of the technical and economic feasibility of aquaculture technologies; 2) a laboratory for the assessment of socioeconomic and environmental impacts of aquaculture technologies; and, 3) on-site training ground for beneficiary communities.

### **4.3.1. Season-long training courses**

Season-long training courses are conducted on-site. A season-long course consists of a series of training modules conducted

throughout the production cycle of a cultured commodity. Each module is usually conducted over a two-three day period and is composed of lectures and hands-on practical sessions.

The purpose of season-long training courses—which can extend for four to six months or longer—is to enable participants to learn technical knowledge and skills by allowing them to participate in actual production activities such as pond/pen preparation, stocking, feeding, water quality management, fish health management, harvesting and marketing. The extended period of training gives participants more time to absorb and understand the course topics. Camaraderie among the trainees and familiarity with their trainers may develop over time; this friendly atmosphere is conducive to sharing observations and solving production problems collegially.

The general topics covered by the training courses are: 1) Aquaculture production systems; 2) stock sampling, feeding, water quality and fish health management; 3) farm-based feed formulation and preparation; 4) business planning and management; 5) harvest, post-harvest handling, and marketing, and other special topics.

The languages used during lectures are a combination of English and Filipino. The local dialects are also used if the lecturers are conversant in them. Visual aids are a combination of the modern and standard implements: PowerPoint presentations, and illustrations on chalkboards or manila paper.

#### **4.3.2. On-site technology demonstration and production runs**

The selection of species and culture systems that will be demonstrated on-site are determined by community consultation, expert observation and analysis, and economic viability. The community consultation helps determine the appropriateness of a technology based on the resources and capabilities of the beneficiaries. SEAFDEC-AQD scien-

tists analyze the techno-bio-physical characteristics of the aquatic resources to determine if the aquaculture technology that will be demonstrated is suitable for them.

The aquaculture farm design is prepared by SEAFDEC-AQD experts in consultation with the clients/beneficiaries/donors. Construction of farm facilities is done with selected beneficiaries before the start of or during the “training-run” production, whichever is more practical and appropriate.

Preliminary financial feasibility analysis is prepared by SEAFDEC-AQD economists using costs-and-returns and discounted financial projections. Financial indicators used are return on investments and payback period, net present value, internal rate of return, and benefit-cost ratio. The indicators are used as budgeting instruments in the production run.

The first production run is a “training run,” closely supervised by SEAFDEC-AQD trainers. Participants perform the actual production operations like stocking, feeding, sampling and monitoring, disease surveillance and prevention, cage/pond repair and maintenance, harvesting, and marketing. The succeeding production runs are operated and managed by the beneficiaries, if they are evaluated as ready and capable, with minimum supervision by SEAFDEC-AQD.

ICDSA project duration is usually three years—a period long enough for the beneficiaries to learn and gain confidence in operating and managing aquaculture farms.

#### **4.3.3. Research studies**

Baseline socioeconomic data are gathered through surveys and from secondary sources prior to or in the early months of the project implementation. At the start of the project, selected areas are studied to determine their carrying capacity as potential sites for aquaculture projects.

At the end of the project, assessments will be conducted to measure, quantitatively and qualitatively, the project impact on the



socioeconomic condition of the beneficiaries and on the aquatic environment. The information will be packaged into policy briefs and presented to LGUs to encourage legislations in support of sustainable aquaculture and fisheries development.

#### 4.4. Highlights of on-going projects

As of January 2008, there are four ongoing ICDSA projects in four provinces—Antique, Capiz, Guimaras and Northern Samar—in central Philippines. The following are the key points of the projects.

##### 4.4.1. Antique province

A three-year (2006–2008) ICDSA project is funded mainly by the Community Development Fund of the province's congressional representative (US\$ 10,000). The municipality of Pandan, one of the project sites, contributed US\$ 2,000.

###### 1) Training courses

###### *a. Seabass cage culture in ponds in the municipality of Hamtik*

Held in June 2007, the training course was attended by 10 pond technicians. The trainees had a maximum of 10 years of formal schooling (elementary grades to high school level).

###### *b. Seabass cage culture in Pandan River in the municipality of Pandan*

Held in July 2007, the course was attended by 20 members of a fisherfolk cooperative, Mag-aba Multi-purpose Cooperative. Most participants are full-time small-scale fishers with educational attainment of up to high school.

###### *c. Mudcrab culture in ponds in the municipality of Tibiao*

Held in August 2007, the course was conducted for students and teachers of fishery courses at the Polytechnique State College of Antique (PSCA). SEAFDEC-AQD has an agreement with PSCA to conduct training courses for fisheries students and

teachers. The goal is to develop PSCA as a training and production center of selected marine and freshwater fishes in Antique Province.

###### 2) On-site aquaculture technology demonstrations

###### *a. Seabass cage culture in ponds in the municipality of Hamtik*

For the nursery operation, four net cages ( $3 \times 2 \times 1$  m; mesh size, 0.5 cm) were installed inside a pond. Hatchery-bred seabass fry were stocked in the first 2 cages at  $130/\text{m}^3$  (780/cage) After 30–45 days, seabass fingerlings with average weight of about 20 grams were transferred to grow out compartments.

For the grow-out phase, a 1.25 ha.-pond was divided by nets into six compartments (2080  $\text{m}^2$ /compartment). Seabass juveniles (ave. wt, 20 g) were released from the first set of 4 units nursery cages to grow-out compartments at 5000 fish/ha (1040 fish/compartment). The second batch of fingerlings from the second set of 4 units nursery cages was released into 3 compartments two months later.

A strong typhoon hit the province midway through the production cycle and caused the overflow of water and escape of fish from the ponds. Fish harvest was done after eight months, when 350–400 g wt was reached. The low survival—less than 50%—was attributed to overflow of water during the typhoon.

Another production run is planned for 2008.

###### *b. Cage culture of seabass in Pandan River*

For the nursery phase, three units of nursery cages ( $3 \times 2.5 \times 1$  m) were set up to grow 1600 fry (2–3 cm long) up to 10–15 cm long. Fry were stocked at  $100/\text{m}^3$ . After 30–45 days, 5–10 cm long seabass fingerlings were transferred to grow-out net cages.

For the grow-out phase, 10–15 cm long fingerlings from the nursery cages were

stocked in 8 units of stationary net cages ( $4 \times 2.5 \times 1$  m) at 20 fish/m<sup>3</sup>. The fish were given feeds formulated by SEAFDEC-AQD.

Selected harvesting was done starting on the 6th month, when the fish reached 400 g. Harvest was completed on the 8th month. Survival was 60%.

### 3) Research

#### *a. Abalone sea ranching in the municipality of Anini-y*

Started in October 2006, this ongoing project aims to determine the technical and financial viability of the culture system. Sea ranching of abalone can be adopted by organized fisherfolk.

#### *b. Socioeconomic survey of the municipality of Anini-y*

The survey was undertaken in late September 2007 to establish a socioeconomic database that will be used in the assessment of the impacts of the abalone sea ranching and other future aquaculture projects.

### 4.4.2. Capiz Province

The three-year (2007–2009) project is funded by the Capiz Provincial Government amounting to US\$ 59,000. The Project has three components: brackishwater aquaculture, freshwater aquaculture and coastal resources management.

#### 1) Training

##### *a. Season-long training on brackishwater aquaculture of grouper and mudcrab in Roxas City*

The training was conducted in the ponds of Capiz State University (CAPSU) in February–July 2007. There were 58 participants: 17 LGU personnel, 19 fishpond/hatchery operators, and 9 students and 13 teachers of CAPSU.

##### *b. Season-long training on freshwater aquaculture of tilapia, catfish and prawn in the municipality of Dumarao*

The first session was conducted in November 2007 for 20 rice farmers whose farms

are perennially flooded due to the unfinished construction of a dam.

#### 2) On-site aquaculture technology demonstration

##### *a. Grouper and mudcrab culture in brackishwater ponds in Roxas City*

Renovation and preparation of 3 units of ponds started in November 2006. Grouper fingerlings and crab juveniles from SEAFDEC/AQD hatcheries were stocked in February 2007, right after the first training module on Aquaculture Production Systems. Stock sampling was done at 15-day intervals to monitor fish/crab growth. Water quality was monitored regularly to determine dissolved oxygen, water temperature and salinity. Mudcrabs were harvested after a four-month culture period.

Results of the mudcrab harvest showed a very low 12% survival. This was due to high water salinity and high water temperature (39°C) during the summer months (March–May). Crab molting is difficult in summer, resulting in slow growth and high rate of cannibalism. Another run is planned during the rainy seasons (May–October) and is expected to produce better results and demonstrate the economic viability of mudcrab culture.

For grouper culture, stock sampling showed encouraging results with fish attaining a 295 g average body weight (ABW) after 6.5-month culture period. Fish growth is within the acceptable range. The harvest was completed at the end of September 2007.

Results showed a 300 g ABW and 89% survival rate.

##### *b. Freshwater cage culture of tilapia, catfish and freshwater prawn in the Badbaran River, in the municipality of Dumarao*

This was part of the hands-on activity of the on-site training course cited above. In November 2007, net cages (8 units of  $4 \times 4 \times 1.5$  m) were installed and stocked with tilapia, catfish and freshwater prawn (ulang).

### 3) Research

#### *a. Socioeconomic survey of rice farmer-trainees in Dumarao*

In January 2008, SEAFDEC-AQD will conduct a socioeconomic survey of the 20 rice farmers who participated in the season-long training course on freshwater culture of tilapia, catfish and prawn in November 2007.

The results of the study will serve as baseline data for the assessment of the socioeconomic impact of the technological intervention.

#### *b. Ecological study of the Badbaran River in Dumarao*

In early 2008, an ecological study of Badbaran River will be conducted to determine its carrying capacity.

### 4.4.3. Guimaras Province

The ICDSA project, called "Pilot Project on Milkfish Cage Culture as Livelihood Option for Guimaras Fisherfolk Affected by Oil Spill," is funded by Petron Corporation, the oil company that chartered the sunken oil carrier that leaked oil in the seawaters of Guimaras in October 2006. The project site is in the Mariculture Park of the SEAFDEC-AQD Marine Station in Barangay Igang in Guimaras. Started in October 2007, this one-year project is estimated to cost US\$ 78,000. Four fisherfolk organizations from four barangays (Igang, Rosario, San Antonio and Santo Domingo) are participating in the project. They are represented by 29 persons from 29 fishing households from the four barangays.

#### 1) Training

##### *a. Season-long training course on milkfish cage culture*

This training course has five phases. Phase I was a 2-day lecture-cum-practicum module conducted in October 2007. All 29 representatives of the four fisherfolk organizations attended Phase 1. The lecture topics

were: Overview of Sustainable Aquaculture; Milkfish Culture in Cages, Pens & Ponds; and Water Quality & Methods of Monitoring. Practicum was on instrumentation and fabrication and installation of net cages. Phase II, conducted in November 2007, was on stock sampling, water quality monitoring, feed formulation and preparation, and cage maintenance. Phases III–IV will be completed in the first quarter of 2008.

#### 2) On-site aquaculture technology demonstration

Three floating net cages were constructed and installed within the Mariculture Park in October 2007. The cages serve both as training and production facilities. Each cage has a capacity of 600 m<sup>3</sup> and was stocked with 24,000 milkfish fingerlings per cage. Estimated culture period is four months. Commercial brands and SEAFDEC-formulated feeds are used. After 75 days of culture, fish ABW was 135g; estimated survival rate was 95%. The estimated profit of US\$ 1000/per cage will be equitably shared by the participating fisherfolk organizations. The money will be used to construct and operate fish cages in their respective areas.

#### 3) Research

##### *a. Socioeconomic survey of participating barangays*

A socioeconomic survey was started in November 2007 to gather baseline data that will be used in the assessment of the impact of the milkfish enterprises on the participating barangays.

##### *b. Ecological survey of the Mariculture Park*

The survey will determine the carrying capacity of the Mariculture Park. Besides the Petron project, other aquaculture projects have been set up in the Park by private firms.

### 4.4.4. Northern Samar Province

Started in July 2007, the 2.5-year project called "Enhancing Adoption of Mud Crab Production Technologies in Northern Samar"

is funded by the Australian Center for International Agricultural Research (ACIAR). Funds are channelled through ACE, an NGO that implements Australian development projects in the Philippines. Estimated to cost US\$ 73,000, the project's beneficiaries are 325 fishing households from four municipalities (Rosario, Lavasares, Lao-ang and Pambujan). The households derive their income mainly from the sale of crabs caught from the wild.

All the training courses were held in the facilities of the University of Eastern Philippines in Catarman, the capital town of Northern Samar.

### 1) Training

#### *a. Season-long training on mudcrab nursery in Catarman*

The Phase 1 of the season-long training course was attended by 30 crab-catchers from the four municipalities. They were chosen by the fisherfolk organizations in their respective towns.

The training methodology was a combination of lectures and practical sessions. Languages used were English and Filipino as well as Waray, the local language. SEAFDEC-AQD brought the ingredients and utensils for the practicum in feed preparation. Exercises on the computations of feed ingredients were conducted to ensure that the participants understood the lectures and the practical sessions.

Phase 2 was on methodology on stock assessment in selected sites. This was attended by representatives of partner-NGOs. The training included lecture and actual mapping and test-run in selected sites.

### 2) On-site aquaculture technology demonstration

#### *a. Nursery*

Demonstration of nursery culture will start in January 2008.

Under Phase 1, "fly"-size crab juveniles (<1 cm carapace width) will be grown to ju-

veniles (2–2.5 cm CW) in 30 days using net cages in ponds.

In Phase 2, juveniles will be grown to match box size (4–5 cm CW) in 20–30 days in net cages or ponds. The crabs will be fed fish and snails.

#### *b. Grow-out*

Juveniles will be grown to marketable size of 300–500 g in 5–6 months.

#### *c. Fattening*

Lean crabs will be fattened in ponds or pens in mangrove areas in 3–4 weeks or until marketable size.

#### *d. Feed formulation*

To reduce the use of fish as crab-feed, low-cost diets, using locally available ingredients, will be formulated for the project.

### 3) Research

#### *a. Mudcrab market survey*

Started in November 2007, the one-year market survey will determine the supply and distribution channels of crabs from the province to crab farms all over the country.

#### *b. Socioeconomic survey*

The baseline data gathering which covers 325 household-participants will start in the first quarter of 2008.

#### *c. Mudcrab stock assessment*

Started in November 2007, the ongoing stock assessment is conducted in two sites—Rosario and Pambuhan—to determine the seasonal trends in relative abundance of mud crab by size, sex, volume (CPUE), stage of maturity, and condition of habitat. The research data will be used to improve local ordinances governing the management of mudcrab stock in the province.

## 5. Problems Encountered

Several problems were encountered during the first year of implementation of the ICDSA Project.

### 1) The “Scientist Box”

Some SEAFDEC scientists are still adjusting from a laboratory-type research setting to “real life” community projects. The mind set of some scientists is still confined to the rigid scientific methodology, something not attainable in real life situations. Scientists need to get out of the “scientist box” to be able to realistically address fisherfolk needs that are immediate and concrete.

### 2) Non-delivery of commitment

Institutional partners, including SEAFDEC, do not always deliver their part of the agreement—in kind or time. Such remissions disrupt work schedules and cause delays that jeopardize the project.

### 3) Cynicism of beneficiaries

Potential beneficiaries are cynical of development projects, such as ICDSA, because of past experiences where their expecta-

tations were not met. Project participants, particularly the impoverished fisherfolk, expect immediate and concrete economic returns for their effort. When this expectation is not met, the participants raise doubts on the validity of the projects. This cynicism causes lukewarm attitude and commitment. It will benefit the ICDSA Project to discuss frankly with the beneficiaries regarding their expectations at the onset of the Project. Furthermore, the role of the project beneficiaries should be clear to them so that they can deliver their part of the deal.

### 4) Risks: natural and technological

Aquaculture technologies may not always perform as projected due to many reasons; both controllable (inputs) and uncontrollable (natural causes). These eventualities should be factored into the financial projections of the project using sensitivity analysis.

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