



## COMMUNITY-BASED AQUACULTURE AND RESOURCE MANAGEMENT: CONCEPTS AND APPROACHES

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### INTRODUCTION

Poverty characterizes most fishing communities in the Southeast Asian region. In the Philippines, the socioeconomics survey of the National Statistics Office shows that 684,500 or 95.3% of the total 718,267 fishing families belong to the low-income group (Herrin and Racelis, 1992). The poverty of fisherfolk is directly caused by the widespread degradation of marine and coastal resources (Lacanilao, 1989), their low educational attainment, lack of skills for alternative livelihood and non-empowerment in local governance (Agbayani, 1995).

Producing food, generating employment and providing basic social services for the burgeoning population, and earning foreign exchange to fuel economic development, are among the top priorities of the Asian region. The region's vast and rich coastal and inland water waters have been a major source of adequate and cheap protein food and livelihood for the people. In the past, the seas teemed with fish. But over the years, overfishing, destructive fishing practices, indiscriminate cutting of mangroves, and industrial and human wastes have gradually depleted the rich aquatic resources.

Aquaculture has become the fastest growing food activity in the world, according to FAO 1996 State of World Fisheries and Aquaculture. In Asia, aquaculture has expanded sevenfold during the past eleven years and has contributed substantially to the region's food security, employment generation, and foreign exchange earnings. About 43% of all fish eaten today globally comes from aquaculture (FAO 2006)

The phenomenal growth of aquaculture in the Asia-Pacific region during the last two decades was market-driven. Appropriate technologies were developed. Governments in the region came up with policies supportive of the industry such as tax incentives, infrastructure development, and exemption of fish farms from land reform programs. Production and export of high value species went in high gear during the 1980s; however, problems related to environmental degradation, particularly water pollution, increasing cost of imported feeds, and destruction of mangroves decelerated production and drastically eroded profits.

Social problems erupted. Small-scale fishers dependent on coastal resources have been adversely affected by the conversion of mangroves to ponds and by the destruction of coral reefs caused by siltation and destructive fishing practices. In the 1970s and 80s researchers, policy makers, and resource managers treated aquaculture merely as farm activity; in the 1990s, they started to look into the bigger picture of sustainability.

The general objective of this course, therefore, is to reconcile aquaculture technology and sustainability development. At the end of the course, the participants are expected to obtain: (1) know the basic concepts and principles of sustainable aquaculture and coastal resources management, and importance of biodiversity conservation; (2) learn practical techniques in resource and ecological assessment; (3) understand the important socioeconomic, institutional, and environmental issues affecting sustainable aquaculture development and resource management ; and, (4) relate sustainable aquaculture technology to resource management; and, (5) apply the provisions of the Code of Conduct on Responsible Fisheries and other relevant legislation concerning sustainable aquaculture and coastal resource management.

## **CONCEPTUAL FRAMEWORK**

The basic elements that will have to be considered in the project formulation on sustainable aquaculture and coastal resources management are: 1) people or the socioeconomic attributes of the community; 2) biophysical characteristics of the coastal and land-based resources; 3) traditional and other existing institutional rules and regulations in the management of resources; and, 4) status of fishing and aquaculture technology in the community (Fig. 1). Market attributes will have to be looked into by project implementers to support the marketing efforts of fish and non-fish products and services from the community.

The integration of the basic elements of the project through an interdisciplinary approach is important in order to understand fully the social dynamics in adopting technologies to get economic benefits from the coastal resources.

The integration process will lead to two action situations; technology transfer and adoption on one side and property rights regimes and institutional arrangements on the other side. The technology transfer and adoption mechanisms will require both research undertaking and development interventions.

Property rights and institutional arrangements define the rules and rights in the management of common properties such as mangrove forests and other coastal resources. The property rights in mangrove areas is a grant of authority from the state to the users in form of tenurial rights and stewardship agreements.

The effects of the two action situations (technology and resource management) will lead to several patterns of interactions or behaviours among the resource and technology users. These behaviours are: 1) “free rider”; 2) reciprocity; and 3) collective action. The most ideal pattern of interaction is the collective action of the community of resource users. In this behaviour, the resource users are interested in attaining a common goal and benefit for all. The two behaviours are individualistic and opportunistic.

The long-term outcomes of the project will be measured in terms of efficiency, sustainability, and equity.

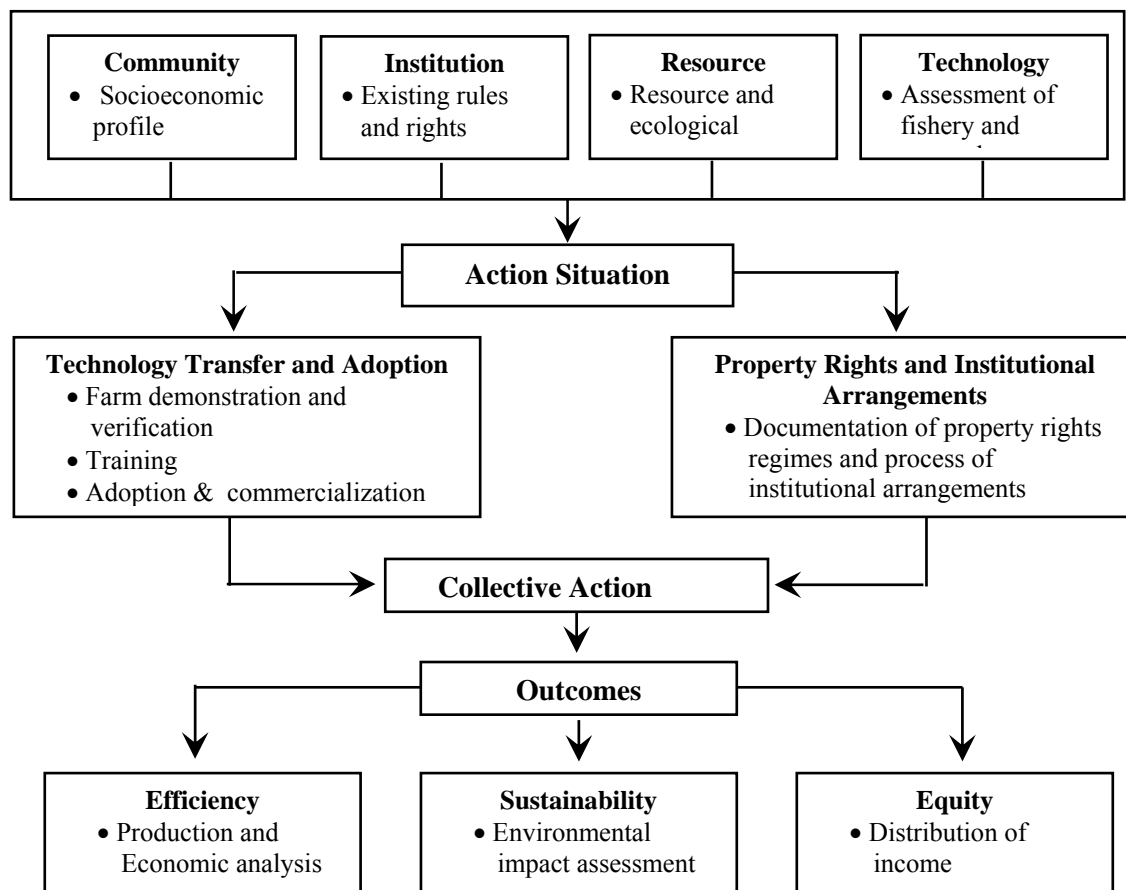


Figure 1. Framework for Community-based Aquaculture and Resource Management

Using the conceptual framework, a research and development agenda can be prepared consistent to the interrelationship between and among the basic elements of the projects and the long-term outcomes.

1. Socioeconomic studies will provide base line information on the sociodemographic attributes of the community. Socioeconomic impact analysis will be done to evaluate the technical and economic efficiencies of the mangrove-friendly technologies. Resource valuation studies on mangrove and other coastal resources (corals and seagrasses).
2. Biophysical and environmental studies will assess the mangrove and other coastal resources before, during and after the management and development interventions.
3. Technology transfer and adoption will include actual field demonstration and verification of mangrove-friendly aquaculture systems. Training and extension services will ensure correct adoption of the technologies and eventual commercialization.
4. Policy studies will document and analyze the process, formulation, and implementation policies and institutional arrangements specially issues pertaining to property rights.

## PRINCIPLES OF SUSTAINABLE AQUACULTURE

FAO defines *sustainable development as the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agriculture, forestry and fisheries sectors)*

*conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable.*

Sustainable aquaculture includes the following principles: (1) maintenance of ecological systems; (2) improvement in economic and social well-being; (3) inter-generational equity; (4) intra-generational equity; and, (5) adoption of precautionary approach (Insull and Shehadeh, 1996). Maintenance of ecological systems applies to the impact of aquaculture production systems on the resources. It is necessary that the entire ecosystems (from the forest down to the coastal areas) be considered in aquaculture development. Improvement of well-being (both human and resources) include better and diversified incomes, improved access to essential services (health, education, credit etc.), maintenance of good social relations and conservation of natural resources. Intergenerational equity is the principle of using the resources for the present economic needs but at the same time conserving them for future generations. Intergenerational equity refers to equitable access and use of the natural resources by the different sectors of society. Precautionary approach refers to being cautious especially if there is a risk or potential irreversible damage to human beings and to nature.

Mangrove forests, seagrass beds and coral reefs, form part of the coastal ecosystems that support coastal resources. Consisting of intertidal flora and fauna, mangrove forests thrive in the tropic and subtropical regions of the world. More than a quarter of this important resource is found in Southeast Asia (Spalding *et al.*, 1997) and have contributed significantly to the socioeconomic well-being of the coastal communities (Field, 1995).

The destruction of mangroves and other coastal environments caused by shrimp farming has also led to the deterioration of local livelihoods (Barraclough & Finger-Stich, 1996) due to conversion and privatization of mangroves and other lands, salination of soil and water, impoverishment of local populations, and food insecurity. While aquaculture is considered as a key alternative to meet problems on food security, its development, however, in the Southeast Asian region has always been market driven. The export demand for shrimp and other high-value species encouraged governments and investors in the region to convert mangrove forests to shrimp ponds. In the Philippines, for example, large scale aquaculture was facilitated by the government with the issuance of P.D. 704 in 1975 with a fisheries decree accelerating fishpond development and BFAR A.O. 125 in 1979 converting fishpond permits from 10-year lease agreements to 25 years.

Added to this ecological disturbance was the adoption of intensive systems to maximize profit, on the part of investors, and provide Southeast Asian economies with the much needed foreign exchange. The adoption of unsustainable aquaculture technologies and the devastation of mangrove forest became a social problem. The economic benefits realized in terms of private profits for big-time shrimp investors, taxes paid to the government by shrimp growers, foreign exchange inflow earnings, and employment of skilled technicians were all negated by the adverse impacts on mangroves and other coastal resources to the detriment of impoverished fishing communities. Moreover, the uncontrolled destruction and exploitation of mangrove resources can be attributed to the lack of property rights regimes and institutional arrangements in managing coastal resources. Mangrove forests are technically government-owned common property where access and use is open to all.

The advent of aquasilviculture provides options for ensuring food security through the practice of mangrove-friendly aquaculture techniques. Aquasilviculture involves more traditional, non-destructive aquaculture techniques combined with sustainable forestry techniques, including limited harvest of mangroves (Primavera, 1993). However, local situations should first be considered before technology interventions are introduced to ensure sustainability of both the resource and the technology.



## APPROACHES AND STRATEGIES

### Property Rights

The “open access” character of the coastal waters w<sup>h</sup>ave led to overfishing. The expression “*the tragedy of the commons*” (Hardin, 1968) has come to symbolize the degradation of the environment to be expected whenever many individuals use a scarce resource in common.

Common property resources are those to which access is both free and open to a set of users or potential users (Christy, 1982). There are several consequences that result from the condition of common property:

1. There is a tendency to waste the resource physically;
2. There is economic waste;
3. Average income of small-scale fishers tend to be close to the bottom scale; and
4. Conflict on resource use arise

The above-stated consequences are very much evident in the Southeast Asian countries. There has been physical (biological) waste in the catch of fish byproducts in fishing expeditions which are either thrown away or used minimally. Milkfish fry gatherers have been observed to be throwing away other species instead of putting them back into the waters.

Too much fishing effort in terms of capital and labor is wasted in catching too little fish leading to economic loss. Commercial fishers have been known to be encroaching on municipal waters in competition with small-scale fishers which has further led to overfishing and consequently low catch for both type of fishers but more so for the small-scale fishers. The “economic rent” (difference between the total revenues and total cost) is dissipated leading to economic loss.

Conflicts between and among different fishers and other stakeholders arise because of different needs, perceptions, and objectives in the utilization of a common resource.

Gordon (1954) stated that “*there seems to be some truth to the dictum that everybody’s property is nobody’s property. Wealth that is free for all is valued by no one because he who is foolhardy enough to wait for its proper time of use will only find that it has been taken by another... the fish in the sea are valueless to the fisherman, because there is no assurance that they will be there for him tomorrow if they are left behind today*”. In economic terms, fishers have high discount rate so that the flow of benefits today is better than the flow of benefits in the future.

An influential model in common property is the logic of collective action (Olson, 1965). The model suggests that groups that tend to act in support of their group interests are supposed to follow logically from a widely accepted premise of rational, self-interested behavior. If the members of some group have a common interest and if they would all be better off if that objective were achieved, it has been thought to follow logically that the individuals in that group would, if they were rational and self-interested, act to achieve a common goal. Olson, however, argued that unless the number of individuals is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, a rational and self-interested individuals will not act to achieve their common or group interest.

Property rights can be classified as public (state), common (community or group of users), and private (individuals or companies). Property rights holders are provided incentives for natural resource management and authorization and control over the resource. Assigning property rights to the resource users such as the community reinforces collective action and shows the commitment of government to devolution of natural resource management. It gives a “sense of ownership” to the holders in order that they will take care of the resource. It is important that the community is recognized as the legitimate property rights holder with the backing of the government in order to effectively enforce the rules and rights in the management and utilization of the coastal resources.

The concept property rights include a bundle of rights which are derived from the government, customary, religious law, and other normative frameworks (Meinzen-Dick and Knox, 1999). The bundle of rights is comprised of: **use** rights, including access (to enter the resource domain) and withdrawal (to remove something); **control** rights, including management (to modify or transform the resource) exclusion (to determine who else may use the resource), and alienation (to transfer rights to others) (Schlager and Ostrom, 1992 in Meinzen-Dick and Knox, 1999).

The concept of property rights as a resource management strategy requires the collective effort of different users and stakeholders. The property rights in mangroves is a grant of authority from the state to users in the form of tenurial rights and stewardship agreements. These rights are guided by rules on what acts are permitted and forbidden in exercising the authority provided by the right. Well-specified property rights provide incentives for either individuals or groups to invest in resources and maintain them over time in order to obtain benefits. Property rights are characterized by: 1) exclusivity or the right to determine who can use or access the resource; 2) transferability or the right to sell, lease or bequeath the rights; and, 3) enforcement or the right to apprehend and penalize violators of the rights (Randall, 1987).

In the devolution of coastal resource management as provided for by the Local Government and the Fisheries Code in the Philippines, the critical sets of rights are the control rights of management and exclusion. Local Government Units can zone the municipal waters to identify the areas for different uses. It can exclude unauthorized users to protect the legitimate property right holders. Property rights regimes can only be as strong as the institutions that support them. Local Government Units (LGUs) must have political will to enforce the laws that will exclude encroachers (commercial fishers, for example) in municipal waters.

There are cases where claims on the resources are based on customary rights where claimant has a long period of usage of the resource and or had substantial investment in developing the resource. An example is the customary use rights of mangrove areas where generations of families have been using the resource like extracting wood and other commodities. Customary rights exist in cases where that era no laws governing the use of resource or where law enforcement is weak. Religious laws may not allow extracting water from specific sources. In some communities, local norms may not allow women to use some natural resources.

### **Public vs Private Control of Common Property Resources**

There are authors who advocate that common property resources require public control if economic efficiency is to result from the development. Centralized government control on natural resources have been adopted in developing countries especially among “iron governments” or perhaps military governments. Smaller countries like Singapore and Brunei have been relatively successful in centrally controlling and regulating the use of natural resources. Big countries that are highly centralized or authoritarian cannot claim the same results (Russia and other East European countries) where environmental destruction was rampant in exchange for economic development.

The proponents of centralized government control want an external government agency to decide the strategy (who, how, where, when) on using the resource. In the Philippines, the national government adopted a “top-down strategy” in formulating policies in the utilization of common-pool resources such as fisheries prior to the enactment of the Local Government Code (LGC) of 1991. Resource users and stakeholders were seldom consulted in the planning and policy formulation process. The destruction of coastal resources and the marginalization of fisherfolk are the results of this strategy.

Other policy analysts advocate the imposition of private property rights in order to avoid inefficiency in the use of common pool resources. This strategy, however, may work in land



resources but is doubtful in non-stationary resources such as fishery resources where establishments of individual rights is difficult. Common ownership is the fundamental fact affecting almost all regime of fishery management.

### **Territorial Use Rights in Fisheries (TURFs)**

The concept of tenurial rights such as TURF has long been existing specially in terrestrial resources. It is easier to imagine tenurial use rights among herders in a piece of land than TURFs among fishers because of the three-dimensional feature of the marine resources where stocks such as fish migrate from one place to another. TURFs deals on the ownership of the right to use rather the ownership of the resource.

In order for TURFs to be effective, there are certain kind of rights that need to be exercised: (1) the right of exclusion or right to limit or control access to the territory; (2) right to determine the amount and kind of use within the territory; (3) right to extract benefits from the use of the resources within the territory; and (4) right to future returns from the use of territory (Christy, 1982).

The right of exclusion or to limit access to the resource removes to a certain degree the condition of common property. Control over the resource, however, is not absolute. For example, the flow of nutrients or even pollutants to a territory is difficult to control in a marine resource. TURF is more site specific than resource specific.

The right to determine the amount and kind of use within the territory neutralizes the effect of overfishing that can occur in a common property resource. The right to extract benefits from the resource are the returns on the investment (capital) or returns on labor. It can also mean non-monetary benefits such as enjoyment on the use of the resource.

The right to future benefit is very important in the implementation of a sustainable fishery resource management regime since it assures resource users that benefits will continuously flow now and in the future. An example of a fishery management regime is “closed season to give “breathing time” for the resource to recover on the premise that the future benefits will be enjoyed by the fishers.

The tenure of localized TURFs for fisherfolk must therefore be in perpetuity in order to ensure compliance on the rules and rights in TURFs not only in the present but also in the future.

Our concern in the adoption of TURFs as Fishery management strategy is more on the localized TURFs (fishing communities) rather than generalized TURFs such as extended economic zone (EEZ). The area covered by TURFs for a fishing community should be big enough so that the use of the resource outside the territory will not diminish the use inside the TURFs area. The area may include the surface, bottom, or the entire water column which will include sedentary and migratory species within the territory. It is advisable to put boundary markers but not to enclose the area which will prevent the natural flow of water affecting other resource users outside the TURFs area. Besides, it can be expensive and not practicable.

In the use and management of a TURFs, the users (preferably organized fisherfolk) have the right to determine the objectives being sought from the use of the territory. Because of this right, the organized fisherfolk will have the opportunity and sufficient incentives to manage the resource within the territory. The concept of a community-based coastal resource management, (CBCRM) then becomes an effective overall strategy of managing common pool of resources.

In study of five fisherfolk communities in the provinces of Iloilo, Antique and Guimaras, the fisherfolk-respondents perceived that TURFs are beneficial to them (Siar, et.al. 1993).

### *Conditions for an Effective TURFs*

#### A. Natural Resource Attributes

The biophysical attributes of the resource must be considered in order to fully enjoy its benefits. Areas with sedentary species (shellfishes, invertebrates) and other site-attached or associated species (those that depend on natural and artificial reefs) are good sites for TURFs. Suitable sites for cage culture can also be considered as a good TURF area. An area which is considered as a “route” of migratory species can also be considered as TURF area,

#### B. Boundaries

Setting of boundaries to accurately define the territoriality of the TURFs area is critical in the implementation of the rules and rights set by fisherfolk community. It also makes surveillance and monitoring of the territory easier. It will prevent conflicts with other resource users and stakeholders.

### **Community-based resource management**

Community-based coastal resource management or CBCRM and co-management strategies have been successfully implemented in the Philippines (Pomeroy and Carlos, 1997; Agbayani and Babol, 1997; Primavera and Agbayani, 1996). The people-centered approach of CBCRM focuses on capacitating the fishing community through training, education and skills development in the resource management, enterprise development, training on paralegal issues, gender sensitivity, and lobbying among others. These people-empowering activities have prepared the community to be effective and active co-managers of coastal resources. Community-initiated institutional arrangements on marine sanctuaries and reserves have also been implemented in various fishing communities in the Philippines. The concept of territorial use- rights in fisheries (TURFs) which grants the organized community property rights over coastal resources has been encouraged and legitimized by the government through existing laws, such as the Local Government Code of 1991 and the Fisheries Code of 1998. In mangrove forests, Administrative Order No. 15 (1990) of the DENR or the Department of Environment and Natural Resources sets aside public forests as “communal mangrove forest” for the exclusive use of residents of the municipality from which said residents may cut, collect, remove mangrove forest products, such as firewood and mangrove timber for charcoal production for home consumption in accordance with forest laws and regulations.

Community-based strategies are effective in addressing localized problems through localized solutions especially those pertaining to the exploitation of common property resources. External agents, e.g., NGOs, academic and research institutions, government agencies, have predominantly initiated CBCRM activities. The relationship of these external agents to the community, however, should be temporary until the community has developed a sense of preparedness and self-reliance.

Beyond the community-based initiatives, however, will be the bigger issue of legitimizing locally-accepted institutional arrangements by concerned government agencies. This act of delegating authority to the community to use and manage coastal resources is a co-management arrangement between the government and the local community. The process of co-management involves participation in decision-making, power sharing, and conflict management.

### **Co-management**

The focus of co-management is the issue of property rights or rights to access and limit other users from the resource. Co-management addresses the issue on ownership of resource and mechanism to allocate use rights through rules and regulations. However, to date, literature in mangrove utilization in the country has limited, if any, documentation on informal or customary use-rights appropriation – of their construction, logic and historical transformation. There is a need to look into the social circumstances of the actors because as their circumstance change, so does the





organizational structure of the community. Failures to recognize this aspect would eventually result in resource-use conflict (Cordell, 1992), unsustainable practices and inequitable distribution of benefits (Ruddle, 1994), considering the multiple-use characteristic of this resource.

There is a need to examine and evaluate property rights and collective action on mangrove ecosystems to provide reliable scientific information for policy formation. Considering the vast mangrove resources that have been destroyed, and are presently being converted to different uses, there is a need to rationalize development strategies that will ensure efficiency, equity and sustainability. Poverty and food security are the burning issues confronting developing countries today.

There is a need to balance environmental conservation and food security in the management of coastal resources. Sustainable aquaculture technologies are being tested, verified, and transferred for adoption by fishing communities in the Philippines, Vietnam, Indonesia, and other Southeast Asian countries. During the Workshop on Mangrove-Friendly Aquaculture recently implemented by the SEAFDEC Aquaculture Department and funded by the Japanese Government Trust Fund, in Iloilo City, Philippines participants defined mangrove-friendly aquaculture as; (1) benign; harmonious existence between fisheries and mangrove resources; (2) beneficial to the community and economically viable; (3) enhances biodiversity with minimal impact on the environment; and (4) integrates mangrove rehabilitation and protection with food-producing activities such as aquaculture.