

### *Ecosystem Approach to Aquaculture*

As for aquaculture, the production of which can be categorized as the output of extensive, semi-intensive, and intensive culture systems, this sub-sector has become the fastest-growing food activity globally and has expanded sevenfold during the past decade, contributing substantially to the region’s food security, employment generation, and foreign exchange earnings. In 2018, approximately 46 % of all fish eaten globally came from aquaculture (FAO, 2020b). The rapid growth of the aquaculture sector worldwide and the interaction of aquaculture activities with other economic sectors and natural resource users require a responsible and integrated approach to aquaculture development.

A similar approach – the ecosystem approach to aquaculture (EAA) is “a strategy for the integration of the activities within the wider ecosystem in order that sustainable development, equity, and resilience of interlinked social-ecological systems are promoted in the aquaculture sub-sector” (Soto *et al.*, 2008; FAO 2010c). The three principles in the EAA ensuring that aquaculture as a strategy contributes positively to sustainable development (FAO, 2010c) are shown in **Box 21**:

#### *Way Forward*

Although the EAFM is well recognized in the Southeast Asian region, however, based on the review of the challenges and suggestions from the SEAFDEC Member Countries on the achievements of the EAFM in the region, there are some issues that need to be taken into action to ensure that the EAFM is fully used and implemented. These include the promotion of the EAFM concept which should be continued together with the strengthening of collaboration and coordination among the regional EAFM networks. Capacity building for all relevant stakeholders should also be sustained to enhance the understanding of more numbers of fisheries officers and communities of the concept and principles of EAFM. The consistency of the EAFM activities carried out in the communities should be strengthened, and the EAFM communities to be expanded

and integrated with other related fields (*e.g.* ecologically-based tourism, local fish market village, community learning center). Additionally, full efforts should be put in place in the work process to maintain the achievement of EAFM in each country. The suggestion of Indonesia for SEAFDEC/TD to strengthen the EAFM implementation in Southeast Asia should be considered, and that it is also important for the Southeast Asian countries to develop the legal basis to support the promotion of EAFM implementation in the whole Southeast Asian region.

There is still needed to build the capacities and skills of relevant stakeholders on the application of the EAFM concepts, principles, steps in management planning, and EAFM implementation. In certain AMSs, such as Thailand and Indonesia, EAFM is being integrated into formal educational programs at universities and colleges. EAFM is also being formally adopted by the fisheries departments of several AMSs and is used as the framework for managing their respective national fisheries. The E-EAFM course itself is a living program that continues to be shared and modified to suit the capacity-building needs of learners. Meanwhile, the national, regional, and international EAFM networks and/or technical working groups are being established in partnership and collaboration with national fisheries and other regional and international organizations. For example, SEAFDEC is collaborating with FAO for the GEF Project on Promoting the Blue Economy and Strengthening Fisheries Governance of the Gulf of Thailand through the Ecosystem Approach to Fisheries” (GoTFish Project), and with FAO and BOBLME for the project on Sustainable Management of Fisheries, Marine Living Resources and their Habitats in the Bay of Bengal Region for the Benefit of Coastal States and Communities: Support to SEAFDEC Member Countries aimed at promoting EAFM knowledge and implementation in the AMSs.

#### *6.1.2.2 Community-based and Co-management*

The primary purpose of fisheries management is to establish an appropriate system of management rules based on defined objectives, as well as a mix of management

**Box 21.** Principles in the EAA to ensure that aquaculture contributes positively to sustainable development (FAO, 2010c)

**Principle 1:** *Aquaculture development and management should consider the full range of ecosystem functions and services, and should not threaten the sustained delivery of these to society.*

Developing aquaculture in the context of ecosystem functions and services is a challenge that involve defining ecosystem boundaries (at least operationally), estimating some assimilative and production carrying capacities, and adapting farming practices accordingly. The mix of ecosystem services will depend on wider management practices, and the trade-off among different services must be acknowledged. This is especially important in the case of ecosystem functions that are unique, essential, or threatened to ensure their preservation.

**Principle 2:** *Aquaculture should improve human well-being and equity for all relevant stakeholders.*

This principle seeks to ensure that aquaculture provides equitable opportunities for development and equitable sharing of its benefits. This includes ensuring that it does not result in any undue detriment for any groups within society, especially the most vulnerable. Both food security and safety are to be promoted as key components of well-being.

**Principle 3:** *Aquaculture should be developed in the context of other sectors, policies, and goals.*

This principle recognizes the interactions between aquaculture and the larger system, in particular, the influence of the surrounding natural and social environments on aquaculture practices and results. This principle also acknowledges the opportunity of coupling aquaculture activities with other production sectors to promote materials and energy recycling and better use of resources in general.

means to implement the regulations, which are put in place by a system of monitoring, control, and surveillance (Wilson *et al.*, 2003). Throughout the past decade in the Southeast Asian countries, several management measures have been introduced and applied for the management of small-scale inland and coastal fisheries. Such measures include co-management, community-based fisheries management, integrated management, and government-based management, among others (Muthmainnah *et al.*, 2019). However, choosing the appropriate management measures would be up to the situation of the specific localities.

A system of community-based management, which protects the rights of access by fishing communities, including indigenous peoples, is likely to be the best pro-poor arrangement in many indigenous fishing communities. This could mean restriction of access to the resources to a well-identified group, which helps community property rights reduce the risks of overfishing, thus preventing the fishers from falling into the downward spiral case of poverty and resource overexploitation associated with open access regimes. At the same time, the fact that these property rights are granted to groups rather than individuals ensures a certain level of equity within the community by allowing all members (including the poorest) to access the fishing grounds and therefore could rely on fishing to sustain their livelihoods. As a matter of fact, the concept of community property rights is central to the indigenous peoples and implies the recognition and enforcement of preferential access rights of (indigenous) fishing communities (FAO, 2009c).

As for co-management, which is another approach, the focus is to uphold property rights or rights to access and limit other users from the resource. Co-management addresses the issue of ownership of resources and mechanisms to allocate use rights through rules and regulations. However, to date, literature in many countries had limited documentation on informal or customary use-rights appropriation – in terms

of their construction, logic, and historical transformation. It is therefore necessary to look into the social circumstances of the management actors because as their circumstances change, so does the community’s organizational structure (Agbayani, 2007).

In order to enhance the promotion of community-based management and co-management in the Southeast Asian countries, the Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region 2030 adopted by the ASEAN and SEAFDEC Member Countries specified as a priority action the need to “*Enhance and promote the participation of local communities, fisheries associations and other stakeholders in fisheries management and co-management. In addition, communities should take part in fisheries and stock assessments by providing data, local ecological knowledge, and status of the stocks.*”

Several AMSs have adopted community-based and co-management approaches by applying them in combination with other approaches, such as the Ecosystem Approach (EA), Integrated Coastal Management (ICM), and Rights-based Management, and adapted in their respective countries for more effective and efficient results. **Box 22** shows the definitions of community-based management and co-management, as well as other approaches aiming to enhance the participation of local communities in fisheries management.

*Promotion of co-management and community-based management at the national level*

Some AMSs have recognized the important potential roles of community-based management and co-management systems in contemporary fisheries management. Although community-based management systems have been the most long-enduring fisheries management system in the region, each country is taking different approaches toward the promotion of these systems (**Box 23**).

Box 22. Definitions of fisheries management concepts
<b>Community-based management (CBM)</b> is a central element of co-management and focuses on the community. The government plays a minor role or external player or adviser while community is the major player in the management (Robert, 1995).
<b>Co-management (CM)</b> is a partnership/participative arrangement between local resource users, government, other stakeholders and external agents, sharing the responsibility and authority for fishery management. Co-management focuses on an agreement among partners/users to share power and right to manage. Fisheries co-management can be classified according to the power sharing of the government and fishers. Moreover, co-management is not only for fisheries management but is also a mechanism for fishers and community participation in addressing the problems and needs in terms of community, economic, and social development (Robert, 1995).
<b>Community-based co-management</b> includes the characteristics of CBM and CM, and focuses on the need for people and the community to be involved in resources management, economic development, social empowerment coupled with sharing power and responsibility among the community, external organizations, and relevant institutions (Robert, 1995).
<b>Rights-based fisheries</b> promote the right of fishers to fish or utilize the fisheries resources provided they are licensed or permitted by the competent government authorities that give the licensed fishers’ access and use rights to the fishing grounds. Such rights are accompanied by obligations to comply with the rules and regulations of the right-based regime (SEAFDEC, 2006b).

**Box 23. Adoption of co-management and community-based management in the AMSs**

Cambodia	Cambodia prescribed in 2006 the Law on Fisheries where rights on traditional use of fishery resources for local users are ensured. Subsequently in 2007, the Sub-decree on Community Fisheries Management was enforced, prescribing further details on rights, roles, and responsibilities of community fisheries in fishery management. According to such legislations, local communities in Cambodia all over the country have been actively participating in fisheries management of their respective areas through the Community Fisheries (CFi) with the involvement of government officers and other agencies.
Indonesia	Indonesia has successful cases of community-based and co-management approaches in Buru Island in Maluku Province in collaboration with the government, NGO, and the fishing communities. Products from small-scale fishers in the Island could access the international market creating positive impacts on the welfare of the coastal communities. With such successful cases, the Government of Indonesia is in the process of expanding the coverage of the CBM and CM into other areas of the country.
Myanmar	Community-based fisheries co-management is a strategic priority of the Department of Fisheries (DOF) of Myanmar with coastal communities being engaged in fisheries management. The DOF of Myanmar has adapted and implemented legal and regulatory frameworks for co-management, inshore fishing capacity management, and combatting IUU fishing at the Union level. Moreover, human and technical capacity for co-management at the Union, State/Region, and district levels had also been developed. Co-management institutions at community level are in place and support to MCS is assured based on limiting the access and application of territorial users' rights. As a result, community livelihoods had improved based on sustainable resource use, and increased value adding of the catch and landings.
Thailand	In Thailand, some management functions are delegated to local fishing community organizations as prescribed by the Royal Ordinance on Fisheries, B.E. 2558 (2015) and its amendment. The Inland Fisheries Research and Development Division has continuously implemented projects on CBM of which the local fishers and stakeholders had been coordinately playing important roles. Policy proposals and guidelines for artisanal fisheries enhancement had been developed, where the guidelines are aimed toward increasing the understanding of fishers on fishery management schemes, exchanging opinions on the pros and cons of such schemes, and mitigating the problems caused by the management schemes. Several coastal fishing communities of the country have already applied the guidelines with successful results and proved that these schemes could be self-reliant.
Viet Nam	The concept of co-management has long been promoted in Viet Nam since 1990s until the present. The Government of Viet Nam has recently promulgated the revised Fisheries Law in 2017, including an Article of co-management regulations. To this end, the Prime Minister of Viet Nam also issued Decree No. 26/2019/ND-CP dated 8 March 2019 detailing a number of articles and measures to implement the Fisheries Law. Specific Section of the Decree provides guidance in addressing the issues related to co-management in fishery resources protection.

*Promotion of co-management and community-based management at the regional level*

At the regional level, several organizations including SEAFDEC have undertaken activities to support the AMSs to apply management concepts that promote delegation of some management authorities to the communities and local organizations. SEAFDEC/TD started the promotion of co-management, community-based management, and rights-based fisheries in 1999 by introducing such concepts at a pilot project site in Bang Saphan Bay, Prachuap Khiri Khan Province in Thailand. Shortly after and during the ASEAN-SEAFDEC Conference in 2001, the Resolution and Plan of Action were adopted where one of its Plan of Action specifies the need to “*Establish and implement comprehensive policies for innovative fisheries management, such as the decentralization of selected fisheries management functions to the local level, the progressive introduction of rights-based fisheries management through licensing and community fishing rights, the improvement of vessel registration systems and the development of supporting legal and institutional frameworks.*”

With such regional policy framework at the backdrop, enhanced community participation in fisheries management has been promoted in the Southeast Asian region. Through

the SEAFDEC Project “Towards Decentralized Management of Sustainable Fisheries,” which was implemented shortly after the adoption of the Resolution and Plan of Action, the “Regional Guidelines for Co-management Using Group user Rights for Small-scale Fisheries in Southeast Asia,” was developed. This Regional Guidelines elaborates the delegation of fisheries management authorities on coastal fisheries to local fisheries organizations including the need for them to encourage small-scale fishers to take part in management actions under the government policies and guidelines. Subsequent to the development of this Guidelines, programs and projects had been formulated and implemented with a view to enhancing the capacity of officers of the AMSs on the concept, through training for trainers (TOT) and promoting their implementation through pilot projects at selected sites in the AMSs. The list of projects implemented by SEAFDEC to promote co-management and community-based management in the AMSs appears in **Box 24**.

Considering that prior to the promotion of the CM and CBM approaches, it is important to know exactly the situation and condition of the management areas as well as the participation capability of the community people and government, especially the local officers, SEAFDEC/TD, therefore, promotes the CM and CBM concepts at the national level through the conduct of Training of

Box 24. SEAFDEC projects in promoting co-management and community-based management in the AMSs
<b>2002-2005:</b> Toward Decentralized Management for Sustainable Fisheries in the ASEAN Region (SEC)
<b>2005-2009:</b> Capacity Improvement of Fisheries Community for Fisheries Management and Alleviation of Poverty (TD)
<b>2006-2010:</b> Strengthening Small-scale Fisheries Management through the Promotion of Rights-based and Co-management Concept (TD)
<b>2008-2012:</b> Promotion of Rights-based Fisheries and Co-management towards Institutional Building and Participatory Mechanism for Coastal Fisheries Management (TD)
<b>2015-2018:</b> Enhancing Coastal Community Resilience for Sustainable Livelihood and Coastal Resources Management (MFRDMD)
<b>2014-2019:</b> Facilitating fisheries activity information gathering through introduction of community-based resources management/co- management (sub-project under the project on “Enhancing the Compilation and Utilization of Fishery Statistics and Information for Sustainable Development and Management of Fisheries in Southeast Asian Region”) (TD)
<b>2017-2019:</b> Human Resource Development for Sustainable Fisheries (TD)

Box 25. Some of the recent pilot activities on co-management and community-based management carried out by SEAFDEC/TD
<ul style="list-style-type: none"> <li> <b>Nam Oon Reservoir, Sakon Nakhon, Thailand</b>                      Management actions were carried out using CM and CBM approaches to address the problems of illegal fishing and the decline of fishery resources in the reservoir. While the establishment of conservation zones was completed, awareness building and declaration of the community rules had been promoted. As a result, the fishers and local officers noted that illegal fishing had been reduced which could be due to two key factors, <i>i.e.</i> enhanced understanding of the local people on resources conservation, and participation of fishers in the decision making regarding the management actions to be undertaken.                 </li> </ul>
<ul style="list-style-type: none"> <li> <b>Nam Xouang Reservoir in Vientiane Prefecture and Vientiane Province and Nampakan River in Mai Nampakan Village, Khammouane Province, Lao PDR</b>                      The CM and CBM approaches had been applied for improving the abundance of fishery resources as well as the livelihoods of fishers. After the establishment of the Fisheries Management Committees (FMCs), fishers had been empowered to be able to monitor and undertake surveillance of the fishing activities in their respective areas by themselves. Their livelihoods had been improved through the practice of fish processing and fish culture. As a result, illegal fishing had been reduced and the products from the women’s groups had been selling well that led to improvements in the fishers’ household incomes.                 </li> </ul>
<ul style="list-style-type: none"> <li> <b>Chong Khneas Community Fisheries in Tonle Sap Lake of Siem Reap Province, and Crab bank in Angkaol Village of Kep Province, Cambodia</b>                      In promoting the CBM and CM concepts, SEAFDEC/TD provided the technical support for the development of the conservation zone management plan (fisheries management, rehabilitation, and livelihood) in Chong Khneas Community Fisheries (CFi). The Chong Khneas CFi also collaborated with the officers of the Government of Cambodia to improve the internal rules, and promote awareness building, especially on the MCS system. In another site at Angkaol Village, crab bank is being promoted. Regulations for operating crab banks were developed and enforced through the participation of the Angkaol CFi. In operating the crab banks, fishers voluntarily give the gravid blue swimming crabs to the CFi for spawning and proper releasing of the eggs. The CFi had learned lessons from such approach and become aware of the importance of conserving the resources especially those of the blue swimming crabs.                 </li> </ul>

Trainers (TOT) and Mobile On-site Training (MOT), and follow-up activities on CM and CBM. The recent activities implemented by SEAFDEC/TD on CM and CBM during 2014–2019, are summarized in **Box 25**.

After the implementation of the aforesaid SEAFDEC Project during 2014–2019, the key achievements and improvements attained by concerned communities from the application of the community-based and co-management approaches are summarized in **Box 26**.

### Way Forward

The experience of SEAFDEC in the implementation of CM and CBM in the pilot sites in some AMSs indicated that such approaches could be used and adapted by the other countries in Southeast Asia. However, there are various factors of successes and failures that could be present which differ from area to area, such as the cooperation and technical inputs from governments and/or other agencies, access to microfinance services, cooperative mechanism whether functional or not, types of ownership of

common properties, conflict-resolution among the various resource users, and poverty in the communities. Moreover, the establishment of fishers’ groups or community organizations is a very important factor that determines the success of the implementation of fisheries management activities in their own areas, as well as the support extended by the government and/or other agencies to such groups or organizations. It has also been observed that communities, where leaders of groups are strong, are able to bring about more effective fishery management.

It is therefore important to consider learning lessons from the factors that led to successes and failures for better fishery resources management in the future. Furthermore, the COVID-19 pandemic has impacted the promotion of sustainable fisheries management in the region. It would be crucial therefore for fisheries managers to think about the adaptation measures for the promotion of the fisheries management action plans, which should be in line with mitigating the impacts of the COVID-19 situation on the sustainability of fisheries in the Southeast Asian region.



**Box 26. Key achievements and improvements attained from the application of the community-based and co-management approaches**

- **Development of management and conservation plan**

The development of fisheries management and conservation plan or the rules and regulations is being carried out effectively through participatory approach among the stakeholders concerned, leading to the recognition of the community management plan by the government officers and the community. Moreover, the technical support provided by the SEAFDEC/TD Project and the local government offices had increased the confidence of the fishers in developing and implementing the fisheries management plan by themselves.

- **Improvement of stocks**

Demarcation of the conservation area and enforcement of closed season including MCS is being effectively undertaken through the collaborative efforts between the fishers and government officers, especially in the pilot sites in Lao PDR and Thailand. As a result, the fishers could catch more fish after the project implementation. As for Cambodia, the promotion of crab bank in the pilot site had increased the awareness of local fishers on resources conservation especially the blue swimming crab, which is economically important for the country.

- **Reduction of conflicts in communities**

The cooperation among fishers within communities for the establishment FMCs, formulation of the community rules and regulations, and the collaborative work to address the problems together, had facilitated the reduction of conflicts among the stakeholders in the communities. These had also led to reduced practice of illegal fishing by the community fishers.

- **Enhancement of the roles of women in fisheries-related activities**

Specifically in Lao PDR, the skills of women in fish processing and marketing have been improved. The women's groups have been able to develop their products and find more marketing channels. As a result, the women could generate additional incomes for their households instead of depending only on the fishing activities of their respective husbands. In the pilot sites in Thailand and Lao PDR, the women also play the important role of providing advice during negotiations when problems occur.

### 6.1.3 *Habitat Protection and Fishery Resources Enhancement*

Fishery resources play significant roles in the social and economic aspects of the world. They provide not only a primary source of protein to people but also contribute to their livelihoods especially in coastal and rural areas in the Southeast Asian region. Several countries in the Southeast Asian region are among the top fisheries producers in the world. In 2017, the marine fisheries production in the region was recorded at around 17.33 million mt generating USD 25,292 million (SEAFDEC, 2020a). This was due to the coastal ecosystem in the region being very productive, having high biodiversity of marine fish species, and providing multiple ecosystems and suitable for habitats to fisheries resources.

It is recognized that optimum utilization and a healthy ecosystem is prerequisite for sustainable fisheries production. However, during the past several decades, the growth of regional and national human populations, as well as the development of aquaculture and fishery-related industries, have made great demands on fishery products. Unfortunately, these had increased the demands and the corresponding technology has resulted in the overexploitation of some economically important pelagic and demersal species. The continued dwindling of fishery resources compels most fishers to increase the use of modernized and more effective but destructive fishing methods which adversely impacted the ecosystem, particularly stocks and habitats.

Therefore, strategic fisheries management in the Southeast Asian region is urgent and should be directed towards reducing human pressure on fishery resources, the ecosystem as well as their habitat. Accordingly, the

Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2030 include provisions encouraging the AMSs to “Promote resource enhancement approaches with appropriate monitoring and evaluation programs, e.g. deployment of appropriate resource enhancement structures, restocking of commercially-important aquatic species, and restoration of degraded habitats, taking into consideration possible socio-ecological impacts” (Plan of Action No. 35) and “Promote the adoption of different management approaches to sustainably manage major critical coastal habitats, e.g. mangroves, coral reefs, and seagrasses; and develop and disseminate information and guidance on the use of appropriate tools and interventions” (Plan of Action No. 37).

#### ***Programs for Habitats Protection and Fishery Resources Enhancement***

The programs that have been implemented to alleviate the declining resources or ecosystem degradation include 1) artificial reefs & habitats rehabilitation, 2) catch area management, and 3) restocking & releasing (**Boxes 27 and 28**). It should be noted that these programs should not be carried out as a stand-alone measure but should be integrated with other management measures to ensure the sustainability of the fishery resources.

#### ***Issues and Challenges***

In the past decades, the deployment of ARs and establishment of MPAs, closed season, and *refugia* area were conducted to protect habitat and enhance fisheries resources. However, there is a concern that some are being implemented too quickly, with the intention of meeting political rather than conservation and enhancement targets.