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Southeast Asian Fisheries Development Center

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Editorial

The Association of Southeast Asian Nations (ASEAN) and the Southeast Asian Fisheries Development Center (SEAFDEC) co-organized the ASEAN-SEAFDEC Conference “Fish for the People 2020: *Adaptation to a Changing Environment*” in Bangkok, Thailand from 13 to 17 June 2011. Hosted by the Department of Fisheries of Thailand, the Conference aimed to pave the way for enhancing the contribution of fisheries to food security in the ASEAN region, assess the importance of fisheries to the socio-economic enhancement of the peoples in the region, and address the emerging issues that impede the sustainable development of fisheries in the ASEAN region.

Attended by about 500 participants and fisheries experts from the ASEAN-SEAFDEC Member Countries as well as from other parts of the world, regional and international organizations, and the senior officials and ministers responsible for fisheries of the ASEAN-SEAFDEC countries, the 2011 ASEAN-SEAFDEC Conference was technically backed by more than 100 renowned experts in fisheries from all over the world who served as resource persons in the Technical Session. The financial support of the Government of Japan and that of the ASEAN Foundation through the Japan Solidarity Fund as well as that of the US-Agency for International Development (USAID) through the ASEAN-USA Technical Assistance and Training Facility (AU-TATF) had enabled a number of representatives from government agencies, NGOs, civil society, and other people’s groups to take part in the Conference. Other representatives from the ASEAN-SEAFDEC Countries and from countries in other regions together with members of fisheries associations paid their way to be able to also take part in the Conference. The technical experts provided by the collaborating partners completed the representative mix of the general fisheries stakeholders which surely facilitated the establishment of the apparent direction and guiding principle for the sustainable development of fisheries in the ASEAN region towards 2020.

The 2011 ASEAN-SEAFDEC Conference comprised three main sessions. The *Technical Session* included plenary discussions on sustainable fisheries for food security and thematic discussions on important areas of fisheries concern; the *Senior Officials Session*, attended by the ASEAN-SEAFDEC Senior Officials responsible for fisheries, with adoption of the Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020, and endorsement of the Resolution on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 for further consideration by the Ministers; and the *Ministerial Session*, where the ASEAN-SEAFDEC Ministers responsible for fisheries adopted the Resolution and expressed strong supports to the implementation of the Plan of Action in order to enhance the contribution from fisheries to food security in the region in the coming decade. The Conference also provided platforms for various organizations to discuss

directions parallel with the Conference's ultimate goal of sustainable fisheries development for food security in the ASEAN region through networking and establishment of collaborative mechanisms.

The preparatory processes for the Conference started in November 2008 when the Concept Proposal was presented to the 31st Meeting of the Program Committee of SEAFDEC in Singapore. In later developments, Regional Technical Consultations supported by the Japanese Trust Fund and other donor agencies, were convened by SEAFDEC and collaborating partners to formulate regional policy issues focusing on the emerging challenges that impede the sustainable development of fisheries in the ASEAN region. National Seminars were conducted by the ASEAN Member Countries to facilitate a more extensive consultation with a wider group of national stakeholders. The results of such fora were used as basis for the development of the Thematic Areas for the Technical Session of the Conference and as inputs for the preparation of the draft Resolution and Plan of Action.

As a sequel to the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security in the New Millennium "Fish for the People" in November 2001 which adopted the 2001 Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region, the 2011 ASEAN-SEAFDEC Conference paved the way for the adoption of the Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020.

It should be recalled that for almost ten years, the ASEAN countries had made enormous and significant strides in the implementation of the 2001 Resolution and Plan of Action, some of which have been elucidated in articles that went into volumes 1-9 of the Special Publication *Fish for the People*, and most especially in Volume 9 No. 2 (2011) while other developments are included in this succeeding issue. Our intention of including the progress made by the countries in the volumes of *Fish for the People* is to demonstrate how the ASEAN countries under the ASEAN-SEAFDEC collaborative mechanism had taken actions for achieving sustainable development of fisheries guided by the 2001 Resolution and Plan of Action.

The revitalized 2011 Resolution and Plan of Action adopted during the ASEAN-SEAFDEC Conference in June 2011 would again be used as policy framework and guiding principles for the countries in the ASEAN region in strengthening their efforts towards the sustainable development of fisheries while adapting to the changes in climatic as well as trade environments. In order to take steps forward, SEAFDEC convened the Inception Workshop on Follow-up Activities to the 2011 ASEAN-SEAFDEC Conference in early July 2011, where the required activities and programs to be implemented

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FISH for the PEOPLE

is a special publication produced by the Southeast Asian Fisheries Development Center (SEAFDEC) to promote sustainable fisheries for food security in the ASEAN region.

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with respect to the 2011 Plan of Action were identified and prioritized by the Member Countries based on their needs and requirements.

While the progress of implementation of the Resolution and Plan of Action is continuing, SEAFDEC through the ASEAN-SEAFDEC collaborative mechanism would also continue to drum beat the countries' achievements and let the rest of the world know that the ASEAN countries are focusing their sights to the sustainability of their respective fisheries sectors for food security and socio-economic certainty. The collective effort of the ASEAN countries is also meant to boost the ongoing process of building and realizing a fully integrated ASEAN Community by 2015.

Fish for the People 2020: Adapting to Changes in the Environment

Chumnarn Pongsri, Somboon Siriraksophon and Virgilia T. Sulit

In an effort to enhance the contribution of fisheries to food security in the ASEAN region considering that fisheries is a very important economic sector, the ASEAN and SEAFDEC co-organized the ASEAN-SEAFDEC Conference “Fish for the People 2020: Adaptation to a Changing Environment” in Bangkok, Thailand from 13 to 17 June 2011. Hosted by the Department of Fisheries of Thailand, the Conference also aimed to assess the importance of fisheries to the socio-economic enhancement of the peoples and address the emerging issues that tend to impede the advancement of the region’s sustainable fisheries development.

SEAFDEC and ASEAN Member Countries have made significant progress in promoting sustainable fisheries in the region. The deteriorating state of the world’s ecosystem and environment brought about by climate change as well as social and economic factors, however made it necessary for the Southeast Asian region to keep abreast of the changing environment and be able to address future challenges faced by the region’s fisheries sector, enhance the competitiveness of the region’s fisheries in addressing food security and poverty reduction, and assist the ASEAN countries to adapt with the emerging situations, *e.g.* climate change, international fish trade, economic crisis. Thus, the ASEAN-SEAFDEC Fish for the People 2020 Conference was convened in order to find ways and means of moving forward and sustain fisheries development in the region in accordance with the new framework of the next decade regional direction and Plan of Action.

The next regional directive has been envisaged to steer the ASEAN countries towards new direction in furthering the development of sustainable fisheries as well as its contribution to food security and poverty reduction by accommodating the new emerging issues, *e.g.* climate change, international fish trade requirements, and projected economic crisis due to exploding population in the region and the new paradigm of exploiting and utilizing the fisheries resources. More particularly, such directive is also meant to pave the way for raising the socio-economic status, alleviating poverty and enhancing food security for the people of the region. In addition, such new directive is also envisaged to build closer collaboration among the ASEAN countries towards the realization of a fully integrated ASEAN Community.

During the *ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment”* organized on 13-17 June 2011 in Bangkok, Thailand, the Resolution and the Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 (**Box 1** and **Box 2**) were adopted by the ASEAN-SEAFDEC Senior Officials and Ministers responsible for fisheries. These instruments would serve as policy framework and guidelines for the adoption of priority actions towards ensuring fisheries sustainability for food security and improving the livelihoods of people in the region during the next decade. In order to enhance the effective implementation of the 2011 Resolution and Plan of Action as the new and revitalized regional directive, the existing differences among the ASEAN countries in terms of development status, geo-political characteristics, national human resources and financial capacities, should be taken into consideration in the development of future programs and activities where appropriate, while activities



The Inaugural Ceremony of the Fish for the People 2020 Conference (top); and the Press Conference of the Ministerial Session (above)



should be developed targeting the different groups of stakeholders in fisheries.

Regional Initiatives to Develop the 2011 Resolution and Plan of Action

The preparatory processes for formulating the revitalized regional policy framework to address the emerging issues that impede the sustainable development of fisheries in the ASEAN region, took almost three years in the making. Starting with the submission of the Concept Proposal to the 31st Meeting of the SEAFDEC Program Committee in November 2008, for the organization of the ASEAN-SEAFDEC Conference which would serve as platform for the promotion of a new regional directive, the Proposal went through a series of discussions between the ASEAN and SEAFDEC before it was finally approved in principle in November 2009. The endorsement of the organization of the ASEAN-SEAFDEC Conference came with provisions which specified that the Conference should come up with the next decade Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 to be adopted by the ASEAN-SEAFDEC Ministers during the Conference, and that such instruments should be used by the ASEAN countries as guiding principle and priority actions for enhancing the contribution of fisheries to food security.

Considering such directive, SEAFDEC with technical and financial support from the Japanese Trust Fund and other donor agencies, convened Regional Technical

Consultations (RTCs) to pave the way for the identification and assessment of the issues that affect the sustainability of the region's fisheries and impact on the socio-economic well-being of the peoples in the ASEAN region. Meanwhile, the ASEAN countries also conducted National Seminars to facilitate a more extensive consultation with a wider group of national stakeholders. The combined outcomes from the series of regional and national fora were used as basis for the development of the thematic areas for the Technical Session of the Conference, and at the same time served as basis for the ASEAN countries in preparing the draft new decade Resolution and Plan of Action.

To ensure that all relevant emerging fisheries-related issues could be addressed during the Conference, the regional activities and programs initiated by SEAFDEC (**Box 3**) under the SEAFDEC Policy Framework were taken into consideration during the RTCs. Moreover, the RTCs also considered the initiatives of several regional and international organizations in promoting sustainable fisheries and especially in reducing the vulnerability of the impacts of environmental changes on livelihoods of fisherfolks in the Southeast Asian region (**Box 4**).

Challenges and Vision on Sustainable Fisheries for Food Security in the ASEAN Region

In elucidating the major challenges confronting the sustainable development of fisheries in the region, the Chairperson of the SEAFDEC Council, Dató Ahamad Sabki bin Mahmood (2011) in his Plenary Statement during the 2011 ASEAN-SEAFDEC Conference, stressed on the major concerns that need to be addressed which include: (1) high trophic level that requires effective indicators; (2) impact of climate change; (3) increasing number of legal instruments for the exploitation of the sea; (4) globalization and increasing requirements in global trade; (5) status of marine ecosystem that continues to threaten the sustainability of capture fisheries; (6) people's perspectives on the various facets of capture fisheries; (7) management of commercial fisheries; and (8) complexity of fisheries management. He concluded that sustainable fisheries and food security for the next decade should be pursued in a temporal scale, and that sustainable management of fisheries in the region requires a much wider perspective and multi-disciplinary approaches. In the same vein, the APFIC Secretary, Dr. Simon Funge-Smith (2011) added that ASEAN fisheries is also challenged by the growing gap between the demand for fish and the capacity of the ASEAN region to sustainably supply such demand, and that there is also an urgent need to reduce the negative impacts of aquaculture. All the aforementioned challenges pose problems in the region's efforts towards attaining

**Box 1. Resolution on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020
(Adopted on 17 June 2011)**

The Ministers of the ASEAN-SEAFDEC Member Countries responsible for fisheries met in Bangkok, Thailand on the occasion of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment” on 17 June 2011. Upon agreeing that priority should be placed on the issues identified through the national and regional participatory processes in the preparation as well as at the ASEAN-SEAFDEC Conference, the Ministers adopted the Resolution on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020. Specifically, the Ministers resolved to:

1. Sustain the supply of fish and fishery products from the ASEAN region to improve food security, facilitate poverty alleviation, and improve the livelihoods of ASEAN people dependent on the harvesting, farming and marketing of fish and fishery products, by enhancing the necessary national fisheries policy, legal and institutional frameworks that encourages and support small-scale fisheries/farmers, including providing alternative livelihood opportunities;
2. Further develop strategic partnerships and cooperation to maximize the synergies and complementarities among the various stakeholders - government, private sector, civil society and relevant development partners and donor agencies to address regional and global challenges;
3. Strengthen human capacity of relevant stakeholders through mobilization of resources and the harmonization of initiatives that support fisheries communities and governments, with a special focus on the women and youth;
4. Strengthen fisheries governance by evaluating current constraints to ensure comparability and compatibility between the required practices and operation of fisheries in the ASEAN Member Countries;
5. Further develop regional initiatives to promote a responsible fisheries management mechanism, taking into account the specific social, economic, cultural, ecological and institutional contexts and diversity of ASEAN and ASEAN fisheries in the spirit of the development of the ASEAN Economic Community and the ASEAN Socio-Cultural Community;
6. Implement effective management of fisheries through an ecosystem approach to fisheries that integrates habitat and fishery resource management aimed at increasing the social and economic benefits to all stakeholders, especially through delegating selected management functions to the local level and promoting co-management as a partnership between government and relevant stakeholders;
7. Promote better management of fishing capacity and use of responsible fishing technologies and practices, recognizing the movement towards replacing the “open access” to fisheries resources with “limited access” through rights-based fisheries, and at the same time, secure the rights and well-being of inland and coastal fisheries communities;
8. Foster cooperation among ASEAN Member Countries and with international and regional organizations in combating IUU fishing;
9. Enhance resilience of fisheries communities to anticipate and adapt to changes in environmental conditions of inland and coastal waters, including those caused by climate change, which could adversely affect fisheries and aquaculture of fisheries communities;
10. Strengthen knowledge/science-based development and management of fisheries through enhancing the national capacity in the collection and sharing of fisheries data and information;
11. Enhance the awareness of the contribution that inland fisheries makes to food security and sustainable livelihoods, and include consideration of fisheries stakeholders when undertaking development projects that may impact inland fisheries;
12. Support ASEAN efforts to promote low carbon development by minimizing the contribution of the fisheries sector to green-house gas emissions, with emphasis on promoting energy efficiency and use of alternative energy sources;
13. Improve the working conditions of people engaged in fisheries activities, and strengthen measures for safety of fishing vessels taking into consideration regional specificity;
14. Promote inter-agency coordination of multiple uses of freshwater resources for sustainable development of the resources and conservation of freshwater habitats;
15. Enhance the awareness that aquaculture makes to food security and sustainable livelihoods to deliver a responsible increase in aquaculture production that promotes aquaculture for rural development as means of rational use of land and water resources;
16. Promote cooperation among Member Countries and with international and regional organizations in encouraging responsible aquaculture practices through joint research, technology transfer and human resource development;
17. Mitigate the potential impacts of aquaculture on the environment and biodiversity including the spread of aquatic animal diseases caused by the uncontrolled introduction and transfer of exotic aquatic species and over-development of aquaculture;
18. Promote joint ASEAN approaches and positions in international trade in fish and fishery products indigenous to the region by harmonizing the standards, criteria and guidelines and developing mutually-recognized agreements on sustainability and safety management systems;
19. Support the competitiveness of the ASEAN fish trade through the development of procedures and programs that would certify, validate or otherwise indicate the origin of fish to reflect the need for traceability, sustainable fishing practices and food safety, in accordance with international and national requirements;

**Box 1. Resolution on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020
(Adopted on 17 June 2011) (Cont'd)**

20. Optimize the utilization of catch from water to market by reducing post-harvest losses and waste to increase fish supply and improve economic returns through promotion of appropriate technologies and facilities along the supply chain;
21. Improve technologies and facilities to ensure fish quality assurance and safety management systems, taking into account the importance of traditional fishery products and food security requirements, and promote the development of fishery products as an alternative supplementary livelihood for fisheries communities;
22. Support the Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 adopted by the ASEAN-SEAFDEC Senior Officials; and
23. Pledge the commitment to fully support this Resolution and task ASEAN Senior Officials to implement necessary actions and report progress in the advancement of sustainable fisheries that contribute to a prosperous, stable and peaceful ASEAN Community.

Moreover, the Ministers also agreed that the Resolution should be implemented as soon as possible and use the **Plan of Action** adopted by the ASEAN-SEAFDEC Senior Officials during the Senior Officials Meeting of the ASEAN-SEAFDEC Conference on 16 June 2011, as a guideline for formulating and implementing programs, projects, and activities in the ASEAN countries through appropriate ASEAN-SEAFDEC mechanisms.

food security and improving the livelihoods of peoples in the ASEAN region. Overall, this redounds to strengthened local governance for the management of fisheries and aquaculture.

Sustainable Development of Fisheries in the ASEAN Region Towards 2020

In the Technical Session of the 2011 ASEAN-SEAFDEC Conference, important fisheries-related issues were discussed under eight thematic areas, namely: (1) Enhancing Governance in Fishery Management; (2) Sustainable Aquaculture Development; (3) Ecosystem Approach to Fisheries; (4) Post-harvest and Safety of Fish and Fisheries Products; (5) Emerging Requirements for Trade in Fish and Fisheries Products; (6) Climate Change Adaptation and Mitigation Towards Food Security; (7) Livelihood among Fishing Communities and Prospects of Employment in Fisheries-Related Activities; and (8) Sustaining Food Supply from Inland Fisheries. In his Report on the Outcomes of the Technical Session, the SEAFDEC Secretary-General, Dr. Chumnarn Pongsri,



reiterated that the main objective of the Technical Session was to review the fisheries situation and emerging issues that could impede sustainable fisheries development and tend to hinder the contribution of fisheries to food security and affect the well-being of people in the Southeast Asian region as well as to identify the key conclusions and recommendations that could address those issues and concerns. Taking into consideration those challenges and keeping sight of the visions over the next decade, the Technical Panel Sessions were conducted considering the eight thematic areas and came up with recommendations for the governments of the ASEAN countries to undertake. These general recommendations include: (1) Strengthening governance in fisheries management to enhance the capacity of the countries in achieving sustainable fisheries; (2) Development of the enabling policies for aquaculture operations especially those by the small-holder farmers to adopt better aquaculture practices; (3) Undertaking fisheries-related activities in a more environmental sensitive manner that minimizes the undesirable environmental consequences of fishing practices through the ecosystem approach to fisheries management; (4) Investing in the development of appropriate infrastructure as well as safe and wholesome fish and fisheries production based on the application of effective control and production procedures at all levels along the production chain from catch to the consumer; (5) Addressing the emerging issues that affect international fish trade such as globalization of trade with focus on consumers' protection, and requirements of sustainability of fisheries and aquaculture production as well as promote compliance to the quality and safety standards and requirements with consistency; (6) Incorporating fisheries-related aspects in national action plans related to climate change and building up adaptive capacity of people dependent and involved in fisheries-related activities to cope with changing environment including the effects caused by climate change; (7) Integrating

**Box 2. Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020
(Adopted on 16 June 2011)**

On the occasion of the *ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment”*, the Senior Officials of ASEAN-SEAFDEC Member Countries met in Bangkok, Thailand on 16 June 2011.

Guided by the (Draft) Resolution on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020, and the need to enhance collaboration among government agencies that have responsibility for fisheries and fisheries-related issues in order to harmonize policies, plans and activities that support sustainable fisheries, food security and safety at the national and regional levels, the Senior Officials adopted the following Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 to be used as a guideline to develop programs, projects and activities for the implementation of the Resolution.

A. PLANNING AND INFORMATION

1. Integrate the planning of marine capture fisheries, inland capture fisheries and the aquaculture sub-sectors to promote the sustainable development of the fisheries sector, including harvesting and post-harvest in both capture fisheries and aquaculture;
2. Strengthen the capacity to plan for sustainable fisheries in the context of changing socio-economic and ecological environments through the mobilization of the most up-to-date data and information and the provision of appropriate policy summaries for decision makers;
3. Strengthen national statistical mechanisms for fisheries and aquaculture and the exchange of statistical data and related information. Include other non-routine data and information such as fish consumption surveys as well as mobilizing local and indigenous knowledge with the aim of improving the valuation of fisheries and monitoring their performance, to address the needs of the ecosystem approach to fisheries and adaptation to climate change;
4. Enhance regional fishery information systems and mechanisms to facilitate sharing, exchange and compilation of statistics and information that are required at the sub-regional and regional level and apply, where appropriate, regionally standardized definitions and classifications for statistical data to facilitate regional compilation, analysis and data exchange;
5. Coordinate, decentralize and enhance the sharing of relevant statistics and information of fisheries-related statistical data and information between the national fisheries and other authorities including those responsible for food security, environment, trade, aquaculture, water resources, agriculture/forestry, wetlands, migration/employment and rural development;
6. Further develop simple and practical indicators in support of planning and monitoring of sustainable fisheries;

B. FISHERIES MANAGEMENT

7. Regularly review, update and strengthen national fisheries policy, legal and institutional frameworks through consultation and engagement of government agencies, the private sector, fishers, civil society and other relevant stakeholders;
8. Accelerate the development of fisheries management plans based on an ecosystem approach, as a basis for fisheries conservation and management;
9. Take measures to prevent unauthorized fishing and eliminate the use of illegal fishing practices by building awareness of their adverse impacts, strengthening law enforcement, developing and promoting responsible and selective fishing gears and practices, enforcing regulations and encouraging alternative means of livelihoods;
10. Establish and implement comprehensive policies for an ecosystem approach to fisheries management through effective systems (i) to provide licenses to fish (boats, gear and people); (ii) for community fishing rights/rights-based fisheries; (iii) that provide for the development of supporting legal and institutional frameworks; (iv) encourage and institutional cooperation; and (v) that aid in streamlining co-management;
11. Adopt co-management at all levels and with all relevant stakeholders in the process of planning and policy formulation for management, conservation and rehabilitation of habitats and protective geographical features, as well as policy formulation on the use and management of natural and human resources to ensure that climate change responses are integrated into fisheries policy frameworks;
12. Strengthen the capacity of fisheries communities and the capability of fisheries-related organizations, NGOs and the private sector to better implement necessary actions towards enabling the communities and local organizations to increase resilience, improve livelihoods, alleviate poverty, adopt alternative livelihoods adapt to climate change in support of achieving sustainable development, and encourage the participation of women and youth groups in the process;
13. 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;
14. Raise awareness of the need to develop financial incentives, especially for small-scale stakeholders and cooperatives, e.g. micro-credit, with national and regional institutional assistance for the responsible development of fisheries enterprises and developmental activities that will optimize socio-economic returns and food security;
15. Increase the efficient use of the alternative energy sources and reduce the use of carbon fossil energy by using appropriate fishing gear and fishing boats designs in fishing operations;

Box 2. Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020
(Adopted on 16 June 2011) (Cont'd)

16. Encourage good and appropriate employment practices in accordance with domestic laws and regulations;
17. Develop guidelines and enhance the capacity of relevant authorities and communities to collaboratively resolve conflict with other stakeholders and with other competing users of resources;
18. Investigate the potential of under-utilized fisheries resources and promote their exploitation in a precautionary manner based upon analysis of the best available scientific information;
19. Enhance joint ASEAN programs to better protect the livelihoods of small-scale producers and for a more equitable distributions of benefits gained from both intra and extra regional trade of fish and fishery products;
20. Adjust existing programs to take into consideration the effects of climate change, focusing on the programs for (i) managing fisheries and habitats; (ii) reducing fishing capacity and combating Illegal, Unreported and Unregulated (IUU) fishing; (iii) strengthening local organizations; and (iv) promoting safety at sea and other priority areas. Develop indicators and reporting measures to assess how actions of the programs build resilience to climate change;

MARINE FISHERIES

21. Strengthen regional and national policy and legislation to implement measures and activities to combat IUU fishing, including the development and implementation of national plans of action to combat IUU fishing, and promote the awareness and understanding of international and regional instruments and agreements through information dissemination campaigns;
22. Establish and strengthen regional and sub-regional coordination on fisheries management and efforts to combat IUU fishing including the development of regional/sub-regional Monitoring, Control and Surveillance (MCS) networks;
23. Facilitate consultative dialogue among fisheries legal officers to share, at the sub-regional/regional level, perspectives of the respective legal and regulatory framework in terms of developing MCS-networks and to implement efforts to combating IUU fishing;
24. Build up capacity among Member Countries, including functions for regional and sub-regional cooperation, to effectively meet the requirements of Port State measures and Flag State responsibilities;
25. Conduct research on the impacts of various gear types and methods, including light fishing, trawls and push nets, on ecosystems and populations of aquatic animals and also the effects of fishing vessel discharges and waste disposal on marine ecosystems, to promote the use of selective fishing gears and sustainable devices;
26. Take reference from the FAO International Guidelines on Managing By-catch and Reducing Discards, where applicable, to identify and find solutions to ASEAN by-catch problems, including the excessive catch of juvenile fish;
27. Optimize the use of inshore waters through resource enhancement programs such as promoting the installation of artificial reefs and structures, encouraging coordinated and effective planning for coastal fisheries management programs, undertaking environmental impact assessment studies, restocking of commercially-important fish species, as appropriate, and give priority to human resources development for the implementation of such programs;
28. Ensure the inclusion of fisheries objectives in the management plans of future Marine Protected Areas (MPAs) and promote the adoption and use of the *refugia* concept in line with the ASEAN/SEAFDEC Regional Guideline on the use of Fisheries *Refugia* in Capture Fisheries Management, where appropriate;
29. Recognizing the different management approaches that are required, sustainably manage major critical coastal habitats, such as mangroves, coral reefs and sea grasses; and develop and disseminate information and guidance on appropriate tools and interventions;
30. Strengthen efforts to address safety at sea, including considerations of working conditions and socio-economic development, and ensure that these considerations are addressed by all concerned authorities while improving monitoring and control of the status of conditions, especially on small fishing boats;
31. Assess the possible impact of government subsidies on fisheries, particularly the impact on the special requirements and the needs of small-scale fisheries in the region;

INLAND FISHERIES

32. Establish and implement comprehensive policies and supporting legal and institutional frameworks for an ecosystem approach to inland fisheries management by integrating fisheries and habitat management that devolves co-management to the local authority and stakeholders, and at the same time strengthens the rights of communities and develops rights-based fisheries;
33. Undertake campaigns to promote awareness of the importance of freshwater fisheries for local food security, and the importance of rehabilitating and restoring habitats for migratory freshwater fish, restocking indigenous fish species to enhance productivity and encouraging culture-based freshwater fisheries, where appropriate;
34. Develop inter-agency coordination (national/sub-regional) on multiple-use water resources of the wetlands/flood-plains to sustain freshwater fisheries, mitigate conflicts between users and also encourage better coordination to address trans-boundary inland fisheries management issues;
35. Ensure the sustainability of inland fisheries by maintaining ecological health of the ecosystem, particularly the inter-connectivity of habitats and the specific management needs during the dry season. Develop mitigating measures for the adverse impacts on inland fisheries that may be caused by the construction of water infrastructure and alteration of water ways;

**Box 2. Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020
(Adopted on 16 June 2011) (Cont'd)**

36. Encourage coordinated planning on the use of inland rivers, water-bodies and flood plains through (i) resource enhancement programs; (ii) inland wetlands and fisheries management programs; (iii) environmental impact assessment studies with regards to structures that might impact on aquatic resources; (iv) the consideration of restocking of locally and/or commercially-important inland fish species; and (v) giving priority to human resources development for the implementation of such programs;
37. Formulate guidelines to promote the use of practical and simple indicators for inland/flood-plain fisheries within the national inland fisheries management framework, to facilitate (i) timely local level fisheries management decisions with due respect to the large number of people/farmers that take part in fishing; (ii) dialogue to ensure that the inter-connectivity of fish migration path is kept as a tool for management/conservation measures; and (iii) adaptation to the effects of climate change within catchments;
38. Monitor the impact of the structures that might affect migration and spawning of fish through a consultative process that involves collaboration with the regional organizations;

C. AQUACULTURE

39. Ensure that national programs and policies on aquaculture address social, economic and environmental aspects of sustainable aquaculture to improve food security, livelihoods, employment and poverty alleviation by (i) providing the mechanisms and enabling environment for good aquaculture practices, efficient markets and fair trade; (ii) strengthening the capacity of small-holder farmers; and (iii) promoting inter-agency collaborations;
40. Develop and implement ASEAN guidelines for environment-friendly and responsible aquaculture and good aquaculture practices that cover (i) the integration of quality and safety management systems for products with significant trade potential; (ii) the harmonization for chemical use and food safety in aquaculture; (iii) the development of product traceability systems from farm to market; and (iv) harmonization of the quarantine and inspection/sampling procedure and Sanitary and Phytosanitary (SPS) measures for aquaculture products to secure food safety;
41. Integrate aquaculture into rural development activities within the context of multiple-use of land and water resources through inter-agency coordination in policy formulation, project planning and implementation, stakeholder consultation, extension services and technology transfer, participate in and provide support to regional initiatives that will assess the role of aquaculture in poverty alleviation for better policy formulation;
42. Implement measures or strategies at national and local level to (i) monitor and regulate aquaculture operations; (ii) prevent over development; and (iii) ensure that activities are carried out in an environment-friendly manner. This also includes effectively enforcing regulations to avoid conflict in the use of common resources and adopting the concept of environmental capacity as a strategy to prevent aquatic pollution brought about by intensification of aquaculture activities;
43. Provide government support for research and development (R&D) on (i) improving existing genetic resources; (ii) assessing the impact of climate change on broodstock management; and (iii) the feeding and disease management of broodstock;
44. Promote the production and distribution of specific pathogen-free (SPF) and quality seed through the (i) establishment of certified government or private hatcheries as sources of quality seed; (ii) dissemination of new breeding technologies and techniques for the effective distribution and maintenance of genetically improved strains; and (iii) implementation of sound policies that will promote better hatchery management practices, including the responsible collection and use of wild broodstock and seed;
45. Apply the concept of aquatic biosecurity by providing support to (i) research for development of domesticated, genetically improved, specific pathogen-free (SPF) cultured species; and (ii) the small-scale hatchery operators and farmers so as to enhance their access to healthy broodstock and improve their ability to adopt, at the farm level, the established techniques for aquatic animal health care;
46. Formulate and implement complementary and supportive policies that will (i) build the capacity of small-scale farmers and hatchery operators in adopting simple broodstock and hatchery technologies and innovations; (ii) enhance small-scale farmers and hatchery operators' access to quality broodstock and SPF seeds produced through farmer-friendly broodstock management methods; and (iii) foster strong cooperation between the public and private sectors engaged in development and dissemination of quality broodstock and seed stock;
47. Encourage good and appropriate employment practices in accordance with domestic laws and regulation;
48. Raise awareness of the need to develop financial incentives and micro-credit, with national and regional institutional assistance, for the responsible development of aquaculture enterprises and developmental activities that will optimize socio-economic returns and food security;
49. Reduce the risk of negative environmental impacts, loss of biodiversity, and disease transmission by regulating the introduction and transfer of aquatic organisms in accordance with the Regional Guidelines on the Responsible Movement of Live Aquatic Animals and Plants;
50. Continue the national efforts to control serious disease outbreaks by providing government support to (i) R&D to improve the ability to handle new and emerging diseases and surveillance of transmission of diseases to wild populations; and (ii) regional initiatives on harmonization of regional disease control standards, disease reporting and implementation of contingency plans to handle new and emerging diseases;

**Box 2. Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020
(Adopted on 16 June 2011) (Cont'd)**

51. Further enhance the capabilities in the diagnosis and control of fish diseases within the region through (i) continued support in development of technology and techniques for disease identification; (ii) promotion of the widespread use of affordable, field-friendly, rapid and standardized diagnostic tests; and (iii) the establishment of regional and inter-regional referral systems, including the designation of reference laboratories and timely access to disease control experts within the region;
52. Develop regional warning systems on aquatic animal health and diseases to inform other Member Countries of relevant epidemiological events and to raise awareness of new diseases that may pose risks. Build emergency preparedness capacity through rapid and timely responses to reduce potential catastrophic consequences of diseases;
53. Improve the efficient use of aquatic feeds by strictly regulating the quality of manufactured feed and feed ingredients and support continued research for developing suitable alternative protein sources that will reduce the dependence on fish meal and other fish-based products. This effort will include the consideration of ingredients not derived from wild caught fish, encouraging the culture of species requiring no or low fish meal content in their feed and applying effective feeding management practices, taking into account the need for cultural and social acceptance of alternative feed ingredients;
54. Improve human resource capabilities for responsible aquaculture through (i) closer public and private sector collaboration in R&D, paying particular attention to the need for advanced skills in biotechnology and assessment of the efficacy and economics of the use of probiotics and immunostimulants; and (ii) effectively implementing aquaculture education and extension services;
55. Formulate and implement national policies and strategies that will enable the aquaculture sector to mitigate and/or adapt better to the impacts of climate change. These strategies should include providing support to R&D on climate change, increasing resilience, and strengthening the overall capacity of various stakeholder groups and fostering cooperation within the aquaculture sector and with other sectors;
56. Where applicable, encourage good practices in aquaculture such as the FAO Technical Guidelines on Aquaculture Certification;
57. Encourage Member Countries to take a precautionary approach to safeguard the environment from the acceleration of offshore aquaculture, and to consider developing regional guidelines on responsible marine (inshore to offshore) aquaculture;

D. OPTIMAL UTILIZATION OF FISH AND FISHERY PRODUCTS

58. Introduce and provide support for the development and application of technologies that optimize the utilization of catches, reduce post-harvest losses, wastes and discards in commercial and small-scale fisheries and processing operations, through improved processing, facilities and infrastructure development, on-board and on-shore handling, storage, distribution and marketing of fish and fishery products;
59. Promote the production of and preserve the diversity of traditional fish products by assisting producers to secure stable supplies of quality raw materials, meet food safety requirements and to improve product identity, nutritive value and marketing. In the process, promote One Village, One Fisheries Product (FOVOP) and other initiatives to promote local fishery products;
60. Develop traceability systems, with mechanisms as needed to certify or validate the information, for the whole supply chain, and establish regulations and enforcement schemes in line with international standards. Align Member Countries' inspection systems and incorporate strengthened port inspections in the process as a means to improve inspection systems;
61. Strengthen fish quality and safety management systems that support the competitive position of ASEAN fish products in the world markets, including moving towards ISO/IEC 17025 accreditation of national fish inspection laboratories, strengthening capacity and acknowledging the recognized national laboratories, risk analysis and equivalence agreement such as the Mutual Recognition Agreement (MRA) and promote the implementation of the quality and safety management systems among small and medium enterprises in the ASEAN region;
62. Encourage relevant control agencies at all levels in applying appropriate legislation and coordinated activities regarding the handling, processing, distribution, storage, marketing, quality and safety of fish and fishery products;
63. Promote and conduct training programs and develop training materials to upgrade the technical skills and competencies of personnel in the public and private sectors on fisheries post-harvest technology and food safety management system;
64. Raise awareness of the need to develop financial incentives and micro-credit, with national and regional institutional assistance for the responsible development of fisheries and aquaculture enterprises and developmental activities that will optimize socio-economic returns and food security;
65. Encourage good and appropriate employment practices in accordance with domestic laws and regulations;
66. Develop standards and guidelines for aquaculture products handling and transportation, hygienic vessel design and construction, and include training of fish handling as part of the requirement for issuance of permits at all levels for fish vessel crews, and encourage new workers to enter the industry where needed;

E. FISH TRADE

67. Strengthen cooperation among Member Countries to implement international standards with regards to trade on fish and fishery products within the ASEAN region;

Box 2. Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020
(Adopted on 16 June 2011) (Cont'd)

68. Establish regional/ASEAN standards applicable for fishery and aquaculture products that are in line with international requirements and applicable to the region. Harmonize standards, technical regulations and conformity assessment procedures as inputs for the establishment of the ASEAN Policy Guidelines on Standards and Conformance, to increase the competitiveness of fishery products on regional and international markets;
69. Strengthen cooperation and mechanisms among Member Countries to work towards common positions that could be reflected in international fish trade related fora, such as World Trade Organization (WTO), Food and Agriculture Organization of the United Nations (FAO), Office International des Epizooties (OIE), *Codex Alimentarius* Commission, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
70. Engage the private sector (e.g. ASEAN Seafood Federation) in addressing trade-related issues, and in collaborative efforts to promote and sustain regional and international trade;
71. Assist small-scale producers to comply with standards on safety and quality of fish and fishery products by providing support programs including training;
72. Assist small-scale producers from both capture fishery and aquaculture in securing and maintaining access to markets at the national, regional and international levels, and in the process, develop marketing systems that are not capital intensive and accessible for local producers;
73. Encourage and provide guidance to develop/improve branding of fish and fishery products that demonstrate the eco-friendly and socially acceptable nature of ASEAN fish products (e.g. one community one fishery product), including organic standards and coordination of Halal requirements;
74. Encourage the implementation of appropriate international standards and strengthen programs relevant to Sanitary and Phytosanitary (SPS) measures, Technical Barriers to Trade (TBT) measures, R&D, as well as capacity building and awareness raising on fish trade-related issues, and information dissemination recognizing the different status of development in Member Countries;
75. Strengthen risk assessment and R&D related to the use of Genetically Modified Organism (GMO) products in fisheries and aquaculture, including food safety issues;

F. REGIONAL AND INTERNATIONAL POLICY FORMULATION

76. Increase participation and involvement of Member Countries in international fora and technical committees such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), *Codex Alimentarius* Commission, Food and Agriculture Organization of the United Nations (FAO), Office International des Epizooties (OIE), Regional Fisheries Bodies (RFBs), and World Trade Organization (WTO); and promote ASEAN interest, recognizing that fisheries policies of relevance to the ASEAN region are increasingly discussed and agreed upon at the global level.

policy for livelihood improvement with overall water resource planning strategy and development programs, and lending support to directions for diversification of community-based livelihoods in fishing communities while maintaining sustainable use of the resources; and (8) Identifying the appropriate management strategies for inland fisheries development and align these with national poverty alleviation approaches, as well as promoting rights-based approach in inland fisheries and developing strategies for sustaining peoples' basic entitlements such as sufficient food, decent work, freedom from oppression, and the right to a dignified life.

Enhancing governance in fisheries management

In order to strengthen the capacity of the ASEAN countries to achieve sustainable fisheries over the next decade, it has become necessary for the countries to strengthen their fisheries governance by evaluating the current constraints and accommodating international concerns. Governments should therefore address the priority issues in fisheries governance such as over-capacity and effective governance arrangement that support the coexistence of small-scale

and large-scale fisheries taking into consideration the fact that governance of these two types of fisheries should be approached from the holistic point of view and going beyond management of fisheries but other livelihood opportunities and calling for a broad framework like integrated coastal management. Co-management is necessary as the common focus of management to ensure



wider participation and increase the potential ability of the resource utilization, where the development of new institutional and organizational arrangements for co-management is necessary. The movement of the ASEAN towards building a single ASEAN community further necessitates the strengthening of governance mechanisms within the fisheries sector in the ASEAN countries. Thus, governments should move away from directive-based management to consultative management leading to a more open, accountable, transparent and autonomous management process.

Intensifying sustainable aquaculture development

Aquaculture production has grown progressively over the last two decades while at the same time capture fisheries production has declined or stagnated, but the inter-dependence of these two fisheries sectors is further illustrated by the growing demand for fish meal and

fish oil in the production of aquafeeds. This demand issue could be addressed by implementing efficient feed management to reduce feed cost by as much as 50% and



Box 3. Regional Activities and Programs Initiated by SEAFDEC under the SEAFDEC Policy Framework

Past Activities (before 2000) - focused on technology development and dissemination to the Member Countries through research, training and information programs. Four key areas related to the development and transfer of technology in fisheries were on capture fishery technology, post-harvest technology, aquaculture, and the programs supporting fisheries management such as collaborative programs on fisheries resource survey, among others.

Past Decade Activities (2001-2010) - focused on enhancing regional technical cooperation among ASEAN-SEAFDEC Member Countries by involving both government and private sectors through appropriate framework and logistic arrangements by all possible means with a view to reduce disparities and promote solidarity among the Member Countries, of which priority was given to the important issues affecting sustainable fisheries development in the region. Moreover, the importance of the multi-functionality of fisheries focusing on poverty alleviation, livelihoods, and food security was also considered. The main programs were focused on:

- Human resources development in all aspects of fisheries such as responsible fisheries and aquaculture, maximizing the utilization of fish and fishery products, and on quality and safety standards including the application of HACCP;
- Innovative fisheries management, by improving the management concept and approaches for sustainable fisheries, such as strengthening small-scale fisheries management through the promotion of rights-based fisheries management, co-management;
- Stock assessment and enhancement, strengthening the coastal resource assessment capabilities using the national or SEAFDEC research vessels under a cost-sharing policy, and in addition, promoting the regional framework on rehabilitation of fisheries resources and habitats/fishing grounds through resource enhancement;
- Promotion of responsible and sustainable aquaculture, including the development of environment-friendly aquaculture, development of the nutrition-efficient feeds and feeding management, and good aquaculture practices;
- Disease diagnosis and surveillance of existing highly virulent diseases as well as new emerging diseases;
- Food safety and quality assurance system particularly on the analysis and detection of chemical and antibiotic residues;
- Improvement of regional fisheries statistical systems and mechanisms;
- Strengthening joint ASEAN-SEAFDEC harmonized approaches and common positions on priority issues affecting ASEAN-SEAFDEC Member Countries, including those related to international trade in fish and fishery products.

Existing Activities (from 2011 onwards) - focus is on the 2011 ASEAN-SEAFDEC Resolution and Plan of Action adopted by the ASEAN-SEAFDEC Ministers on fisheries, taking into account the required emerging issues and changing of the environment such as those relating to the impact of climate change, fish trade-related issues, poverty alleviation and livelihoods, fisheries sustainability and food safety. The existing and onward programs would focus on:

- Continued promotion of sustainable aquaculture development including accelerating awareness and capacity building in fish health management while stock enhancement would emphasize on internationally threatened and over exploited species;
- Facilitating international and intra-regional trade, continued promotion of quality and safety standards and assurance system especially the food safety of aquaculture products, and traceability system of aquaculture and capture products through the supply chain;
- Improving management concepts and approaches for sustainable fisheries by emphasizing on fisheries governance, and the required adjustment of national policy-management framework to combat IUU fishing through regional cooperation on MCS and improvement of information/data collection, as well as on the promotion of community-based fisheries management or/and co-management under the new concept on ecosystem approach to fisheries;
- Balancing between activities that promote advance/modern technology to support commercial fisheries and activities that target the small-scale fisheries or support livelihoods and food security;
- Strengthening policy dialogue with high level officials of the ASEAN to ensure their continued support;
- Continued promotion of the concept of food safety and quality for CLMV countries (Cambodia, Lao PDR, Myanmar, Vietnam) while providing capacity building opportunities for the development of traditional fish and fish products to ensure that these products meet the standards.

Box 4. International Support Provided to the Activities and Programs in the Southeast Asian Region

Management of Fishing Capacity: Considering that the open-access system of the Southeast Asian fisheries had led to the rapid decline of fish stocks not only in coastal but also in offshore areas directly affecting the livelihoods of fishers in small- and large-scale fisheries, and that over-fishing capacity had been the main cause of IUU fishing in the region, several programs have been supported by FAO/APFIC and RPOA-IUU aiming to reduce fishing capacity in the region.

Integration of Habitat and Fisheries Management: In the past, fisheries management through the concept of establishing Marine Protected Areas had been promoted worldwide including in the Southeast Asian region, where the numbers of MPAs increased rapidly from few hundred to several thousand with the main goal of protecting the existing habitats. However, considering the limitation of fishing areas coupled with the declining of fish stocks in both coastal and offshore areas, establishment of MPAs may not be enough to secure the fish stocks, because many fish stocks do not settle in the MPAs, thus it has become necessary to protect the larval fishes instead through the establishment of the so-called “fishery *refugia*”. For this reason, there is need to integrate fisheries management into habitat management. UNEP/GEF/SCS have worked on this aspect in coordination with countries along the South China Sea and Gulf of Thailand. Similar activities have been conducted by the FAO/APFIC, Mangroves for the Future, and BOBLME in the sub-regional areas.

Policy Development and Regional Management Arrangements: Some regional organizations have made efforts to come-up with regional policy and management arrangements of specific fisheries concerns, such as:

- Regional Policy on Development of Aquaculture by NACA, FAO/APFIC;
- Regional Management Plan of Action for Sharks by BOBLME;
- Regional Plan of Action to Eliminate Illegal, Unregulated, Unreported Fishing by RPOA-IUU/Secretariat;
- National Plan of Action for IUU fishing and for Sharks by FAO/APFIC, RPOA-IUU, BOBLME;
- Establishing Fishery *Refugia* in Sub-regional Areas such as in the Gulf of Thailand, Andaman Sea by UNEP/GEF/SCS and Sida;
- Sulu-Celebes Sea Sustainable Fisheries Management Projects supported by UNDP.

Research and Capacity Building on Marine Ecosystems: Initiatives had been undertaken by German-based Center for Tropical Marine Ecology (ZMT) in some countries in Southeast Asia such as Thailand, Cambodia and Vietnam, while CORIN-ASIA and Wetlands Alliance have also worked on the Promoting the Sustainable Coastal and Aquatic Resources Management. Many of these activities also give more focus on the coastal resources especially working with communities and empowering human resources and adding value to resources at the local level through community-based activities, public awareness and capacity building programs. Another international support related to this subject had been made by the World Bank, DFG (German Research Foundation), among others.

Human Resources Development to Improve Livelihood and Alleviate Poverty: Most regional organizations and donors support HRD programs in line with other relevant programs, like for example the program on Building Local Capacity to Sustainable Wetlands Management operated by Wetlands Alliance, WorldFish Center, MRC, CORIN-ASIA and FAO taking into account the fact that millions of people in small communities throughout Southeast Asia depend in some ways or another, on what the wetlands produce and considering that wetlands is a natural entry point for poverty alleviation. The ASEAN Foundation also gives particular focus on HRD in the ASEAN region. Recently, the Kingdom of Spain supported Cambodia, Indonesia, Philippines and Vietnam through the Regional Fisheries Livelihoods Program for South and Southeast Asia (FAO-RFLP). The Australian Centre for International Agricultural Research (ACIAR) is also one institution that attempts to improve the well-being of peoples in developing countries through its international cooperation in research and related activities on aquaculture development. Other institutions working on these issues include CIDA/ACCC, MRC, NACA, ADB, among others.

consequently reduce environmental impact. Thus, there is the need for enabling policies for aquaculture operations especially those by the small-holder farmers to adopt better aquaculture practices. Governments should also be engaged in the development of high health and diseases resistant broodstock to facilitate access of good quality seeds by small-scale farmers. The countries should also support the coordinated regional initiatives that will continuously monitor new and emerging diseases in order to prevent and control serious disease outbreaks.

Promoting ecosystem approach to fisheries

There has been a growing awareness of the need for fisheries-related activities to be undertaken in a more environmental sensitive manner that minimize the undesirable environmental consequences of fishing practices. Ecosystem approach to fisheries management has been seen as means to minimize habitat damage, changes in food chains in natural ecosystems, and loss

of biological diversity. Governments should therefore integrate ecosystem approach in the management of the fisheries sector, promote networking and develop plans of action on the reduction of impacts of fishing on the



environment, and develop and establish inter-agency collaboration (fisheries, environment, tourism) as well as within fisheries agency cooperation to promote the concept of ecosystem approach to fisheries in the ASEAN region. Moreover, it is also necessary to recognize the value of “local commons” to work towards improving habitat and fish production where “front of sea is one’s own garden under one’s responsibility, and fish is one’s own property to be conserved for next generation”.

Improving post-harvest and safety of fish and fisheries products

To ensure the optimal utilization of fish catches and the safety of fish and fisheries products for consumers and for export, all countries would have to invest in the development of appropriate infrastructures for safe and wholesome fish and fishery production based on the application of effective control and production procedures at all levels along the chain of production from catch to the consumer. This would involve cooperation among all relevant government authorities and working with producers at all levels from small-scale fishers to large-scale commercial enterprises.

Addressing the emerging requirements for trade of fish and fisheries products

The emerging issues that affect international fish trade had been increasing. These include globalization of trade with focus on consumer protection in view of the much greater movement of goods and services both within the region and globally, requirements for sustainability of fisheries and aquaculture production considering the adverse environmental impacts of fisheries-related activities and the quality of food and food products derived from the fisheries sector, and effects of climate change. Compliance to the quality and safety standards and requirements with consistency becomes an obligation to be able to continue trading fish and fish products. For the ASEAN region, such standards and requirements should be harmonized considering equivalence, including equal application of tariffs to all ASEAN countries in order that the countries in the ASEAN region could continue providing huge quantity of fish and fishery products in the world market as well as sustain the competitive position of ASEAN fish and fishery products in the world markets.

Mitigating the impacts of climate change in fisheries and aquaculture for food security

Considerable international attention has focused on the potential impacts of climate change and the need for countries to adapt to changing climates in the future. Despite such attention, the scientific ability to predict future changes in weather, climate and ocean circulation is limited and the nature of potential impacts on fish stocks and the ecosystems upon which they depend is thus even more



difficult to foresee. Governments should therefore address the need to ensure that fisheries aspects are incorporated in the national action plans on response to climate change and integrate climate change into fisheries policy and habitat management program framework, and build up adaptive capacity of people dependent and involved in fisheries-related activities to cope with changing environment, including the effects caused by climate change.

Creating livelihood in fisheries communities

The decreasing trends of catch in many small-scale fisheries and overcapacity of the fishing fleet, would oblige the ASEAN governments to integrate policy for livelihood improvement at the local (households) to national levels with overall water resource planning strategy and development programs, and support directions for diversification of community-based livelihoods in fishing communities within (fish processing) and outside fisheries (textile/batik, local business, microfinance) while maintaining sustainable use of resources. Governments should also recognize and improve the social aspect of fishery modernization (choice of technology, labor access to capital, and credit access to fishing ground), and promote equity including gender equity, sustainability of human well-being, respect for human rights, welfare for those who are dependent on fisheries. Thus, regional guidelines on decent work in fisheries sector as well as on labor standards and practices should be formulated to manage both national and migrant workers working onboard vessels. There is also the need to promote and ensure that safety at sea aspects are addressed by governments and incorporated in policies while monitoring and control of the status and use of small fishing vessels should be improved.

Sustaining food supply in inland fisheries

Inland capture fisheries play a significant role in food security both in urban and rural areas of ASEAN countries and these resources are likely to come under increasing pressure in the future due to the increasing population

Box 5. Expressions of Support for the Sustainable Development of Fisheries in the ASEAN Region

Organizations/Agencies/Academe	Possible Areas of Cooperation
Government of Japan	<ul style="list-style-type: none"> • Continue cooperation in sustainable fisheries development in the region through SEAFDEC
ASEAN Foundation	<ul style="list-style-type: none"> • To participate actively in shaping the future of fisheries development in the region, and cooperate in the implementation in the new Resolution and Plan of Action
USAID - Southeast Asia	<ul style="list-style-type: none"> • Support fisheries development in the region through USAID • Cooperate in developing private-public partnership for food sufficiency and security
FAO/Regional Office for Asia and the Pacific (FAO/RAP) and Asia Pacific Fisheries Commission (AFPIC)	<p>General areas of future cooperation</p> <ul style="list-style-type: none"> • Trawl fisheries by-catch project (GEF) • Resource management • Managing fishing capacity and combating IUU fishing • Capacity building needs • Promote sustainable development in small-scale fisheries <p>Priority Areas of Cooperation</p> <ul style="list-style-type: none"> • Global Record of Fishing Vessels • HRD on climate change • Aquaculture development • Improved management of inland fisheries
WorldFish Center	<ul style="list-style-type: none"> • Improved livelihoods • Large-scale sustainable fish production • Policy development • Aquaculture development • Climate change and building resilience • Inland fisheries, gender • Research within the development context • Develop private-public partnership for food sufficiency and security
Mekong River Commission (MRC) Secretariat	<ul style="list-style-type: none"> • Gender in fisheries • Inland fisheries development and 'land use' • Nutrition and livelihood for rural people • Fisheries management • Impact of infrastructure development on fisheries • Small-scale inland fisheries for poverty alleviation • Co-management in inland fisheries • Aquaculture of indigenous Mekong River species
Bay of Bengal Large Marine Ecosystem Project (BOBLME)	<ul style="list-style-type: none"> • Fisheries, pollution, habitat • Resource management • Ecosystem approach to fisheries • Management Hilsa, sharks, Indian mackerel • Joint Myanmar-Thailand to manage Myiek Archipelago • Ecosystem services • Fisheries statistics • Climate change • NPOA sharks • Sub-regional cooperation in Andaman Sea • Ecosystem Approach to Fisheries framework
Aquaculture and Aquatic Resources Management (AARM, AIT)	<ul style="list-style-type: none"> • Education • Research • Outreach program

in the region. Inland fisheries should therefore be given more attention to ensure local food security in the rural areas. Governments should therefore identify appropriate management strategies for inland fisheries development and align these with national poverty alleviation approaches, strengthen collaboration among concerned agencies to maintain the ecological health of water bodies and the connectivity of the habitats, and promote alternative livelihood especially during seasonal flooding/drought. Promote, in policy development as well as in practice, the

rights-based approach in fisheries that goes beyond mere access limits, while basing development strategies on peoples' claims to their basic entitlements, such as enough food, decent work, freedom from oppression and the right to a dignified life.

Vision of Cooperation in ASEAN Fisheries Towards 2020

The representatives from international and regional organizations attending the 2011 ASEAN-SEAFDEC

Conference expressed their respective support and possible future cooperation for the sustainable development of fisheries in the ASEAN region (**Box 5**). The most essential aspects that could ensure food security from fisheries for the peoples in the ASEAN region were identified as human resources development and community-based approach to fisheries management. Considering that the future of fisheries goes beyond fish production, it is necessary to also assess the resilience and capacity of fishers and fish farmers, and promote resources mobilization. However, since the recommendations that came out from the Technical Panel Sessions of the Conference are wide-ranging, there is a need to prioritize the issues based on their “doability” taking into consideration the available financial resources. The areas of collaboration expressed by the regional organizations focused in the aspects of: partnerships with various stakeholders (private-public partnership), linkage – national, regional and sub-regional levels, academic research network – link into policy making and intervention as well as cooperation, and multi-sectoral initiatives.

Way Forward

In order to consider the outcomes of the 2011 ASEAN-SEAFDEC Conference, SEAFDEC organized the Inception Workshop on Follow-up Activities to the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 in Bangkok, Thailand on 4-5 July 2011. The Workshop was mainly aimed at enhancing the awareness of ASEAN-SEAFDEC countries as well as relevant agencies, institutions, organizations, and donor agencies on the Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 that were adopted by the ASEAN-SEAFDEC Ministers and Senior Officials responsible for fisheries during the Conference. Although the Technical Session of the Conference came up with recommendations that provide in totality a clearer picture on how the countries in the ASEAN region should move towards ensuring sustainable development of fisheries and enhancing the contribution of fisheries to food security for the people in the region, the output generated were of different strata. Therefore, the Workshop also aimed to identify the gaps where more efforts should be exerted as well as the relevant organizations that can work in the region and play the roles in supporting the ASEAN countries in the implementation of the Resolution and Plan of Action. Considering that the recommendations comprise wide-ranging sets of issues and concerns, the Workshop was also meant to prioritize such concerns in order to come up with doable programs and activities and attain the common objective of sustainable fisheries development for food security in the ASEAN region.

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Securing the Safety of Fish and Fishery Products of Japan

Fisheries Agency of Japan

The most powerful earthquake that hit Japan on 11 March 2011 triggered an extremely destructive tsunami with waves as high as 40 meters and speed of about 800 km/hour, seriously affecting the coastal Prefectures of Miyagi, Iwate and Tohoku, while the waves also traveled up to 10 km inland. In addition to loss of lives and properties, infrastructures especially in the affected coastal areas were also destroyed resulting in loss of livelihoods in fishing communities. Moreover, the tsunami also caused serious nuclear accidents such as the meltdowns of the reactors in the Fukushima Dai-ichi Nuclear Power Plant (NPP) complex. As a result, the Tokyo Electric Power Company (TEPCO) which operates the Fukushima NPP had to discharge low-level radioactive stored water to the ocean to avoid further damages to the Fukushima NPP. Since then, TEPCO has been constantly monitoring the radiation level in the areas adjacent to the Fukushima NPP and at one point, TEPCO said that there had been no significant change in the sea area compared to the situation one week before the water was discharged, and that efforts are being made by TEPCO to bring down the radiation level in the sea near the Fukushima NPP to a “downward trend”.

After the nuclear accidents in the Fukushima Dai-ichi Nuclear Power Plant (NPP) complex, the Government of Japan through the Fisheries Agency immediately carried out monitoring programs to measure the levels of radioactive substances contained in fish and fishery products obtained from the waters near the Fukushima NPP as well as the seawaters along the coastal areas of Japan. This was aimed at responding to the critical situation when reports indicated that radioactive substances have been detected in the seawaters near the Fukushima NPP. The radioactive substances must have originated from the discharge of contaminated water, atmospheric fallout, and precipitation washed out into the sea. The monitoring points for radioactive materials in fish and fishery products in Japan are shown in **Fig. 1**. As of 29 June 2011, the summary of the monitoring results indicated that 57 samples out of 767 fish and fishery products sampled for contents of radioactive substances (**Table 1**), showed levels of radioactive substances that exceed the Provisional Regulatory Values (PRV). To ensure the safety of the fisheries products in the market, the Government of Japan imposed the suspension of related fishing activities and market distribution as soon as monitoring reports would indicate that the levels of radioactive substance residues in fish and fishery products are found to exceed the PRV levels (**Table 2**). The basic policy of the Government of

Japan for Inspection of Radioactive Substance in Fish and Fishery Products is shown in **Box 1**.

As reported, over 99% of the discharges of radioactive substances from the Fukushima NPP into the sea occurred during the period from 28 March to 11 April 2011. Starting in mid-April 2011, discharges of radioactive substances have drastically decreased. As a matter of fact, the levels of radioactive substances in seawaters beyond the 30 km radius from the Fukushima NPP have constantly been below the detectable levels.

Nevertheless, it has also been reported that a number of trading companies still refrain from buying fish and fishery products from Japan, and that some countries maintain excessive restrictions against imports of fish and fishery products from Japan. The Government of Japan is therefore asking due consideration on the current situation since series of monitoring programs and control measures (**Box 2**) are being undertaken and enforced to ensure the safety of fish and fishery products from Japan in the market.

For more information, please visit: http://www.jfa.maff.go.jp/e/secure/pdf/110630_summary2.pdf, and <http://www.jfa.maff.go.jp/e/secure/pdf/110630.pdf>.

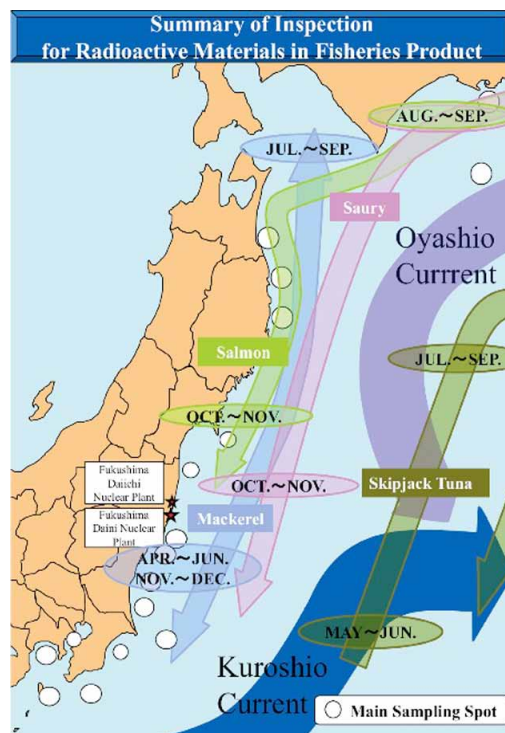


Fig. 1. Monitoring points for radioactive substances in fish and fishery products in Japan after the nuclear accident in the Fukushima Dai-ichi Nuclear Power Plant

Table 1. Results of monitoring radioactive substances in fish and fishery products in Japan (as of 29 June 2011)

Commodities	Total no of samples	Samples with levels of radioactive substance exceeding PRV level	Species with radioactive substance exceeding PRV level	
Saltwater fishes	436	22	Juvenile Japanese sand lance (<i>Ammodytes personatus</i>)	12
			White bait (Family: Salangidae)	4
			Fat greenling (<i>Hexagrammos otakii</i>)	3
			Brown Hakeiling (<i>Physiculus fulvus</i>)	2
			Stone flounder (<i>Kareius bicoloratus</i>)	1
Invertebrates	113	7	Mediterranean mussel	1
			North Sea urchin	2
			Surf clam	3
			Japanese mitten crab	1
Seaweeds	34	5	Wakame seaweed	1
			Hijiki seaweed	1
			Arame seaweed	3
Processed Seafood	14	0		
Freshwater fishes	162	23	Ayu sweet fish (<i>Plecoglossus altivelis</i>)	10
			Land-locked cherry salmon (<i>Oncorhynchus masu</i>)	7
			Japanese smelt (<i>Hypomesus nipponensis</i>)	2
			Japanese dace (<i>Tribolodon hakonensis</i>)	3
			White spotted char (<i>Salvelinus leucomaenis</i>)	1
Marine mammals	8	0		
Total	767	57		57

Note: For more information visit: <http://www.jfa.maff.go.jp/e/inspection/index.html>

Table 2. Indices for restrictions on intake of foods (Cs-Cesium, I-Iodine; Unit: Becquerel (Bq)/kg)

Commodities	Cs-134, Cs-137					I-131			
	Drinking water	Milk, dairy products	Vegetable	Grain	Meat, Eggs, Fish, Others	Drinking water	Milk, dairy products	Vegetables (root crops, potatoes)	Others
Codex*	1,000	1,000	1,000	1,000	1,000	100	100	100	100
Japan	200	200	500	500	500	300	300	2,000	2,000
USA	1,200	1,200	1,200	1,200	1,200	170	170	170	170
EU	200	500	500	500	500	300	300	2,000	2,000
Thailand	500	500	500	500	500	100	100	100	100
Singapore	1,000	1,000	1,000	1,000	1,000	100	100	100	100
South Korea	370	370	370	370	370	300	150	300	300
Hong Kong	1,000	1,000	1,000	1,000	1,000	100	100	100	100
Chinese Taipei	370	370	370	370	370	300	55	300	300
Philippines	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Vietnam	1,000	1,000	1,000	1,000	1,000	100	100	100	100
Malaysia	1,000	1,000	1,000	1,000	1,000	100	100	100	100
China	-	330	210	260	Meat, Fish, Crustaceans: 800 Potatoes: 90	-	33	160	Meat, Fishery Products: 470 Grain: 190 Potatoes: 89

Note: Japan's index for Cesium in Fish is 500 Bq/kg which is rather conservative compared to those of other countries

Source: Ministry of Health, Labor and Welfare, Japan

* The Index (100) by Codex for Iodine shows a total of Sr-90, Ru-106, I-129, I-131, and U-234

The Index (1000) by Codex for Cesium shows a total of S-35, Co-60, Sr-89, Ru-103, Cs-134, Ce-144, and Ir-192

Sr-90 (Strontium-90), Ru-106 (Ruthenium-106), I-129 (Iodine-129), I-131 (Iodine-131), U-234 (Uranium-234), S-35 (Sulfur-35),

Co-60 (Cobalt-60), Sr-89 (Strontium-89), Ru-103 (Ruthenium-103), Cs-134 (Cesium-134), Ce-144 (Cerium-144), Ir-192 (Iridium-192) are various radio isotopes with various "half-lives", where the "half-life" of a radioactive element is the time that it takes for one-half of the atom of that substance to disintegrate into another nuclear form, and can range from mere fractions of seconds to billion years.

Half-life of the corresponding radio isotopes: Sr-90 (29.12 years), Ru-106 (368.2 days), I-129 (1.57x10⁷ years), I-131 (8.04 days), U-234 (2.445x10⁵ years), S-35 (87.44 days), Co-60 (5.27 years), Sr-89 (50.5 days), Ru-103 (39.28 days), Cs-134 (2.062 years), Ce-144 (284.3 days), Ir-192 (74.02 days)

Box 1. Basic Policy for Inspection of Radioactive Substances in Fish and Fishery Products, Japan

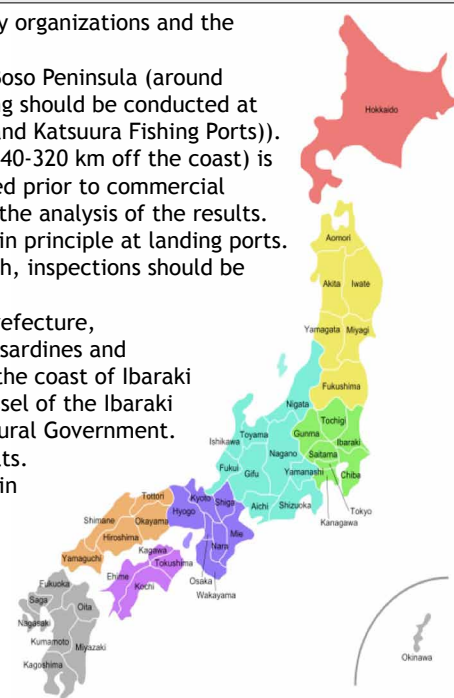
1. Inspection of coastal species

- (a) From Kanagawa Prefecture to Southern Part of Fukushima Prefecture: Based on formation of fishing grounds off the coast of each Prefecture, Prefectural Governments should designate areas where inspection is necessary, and conduct sampling once a week in principle (once every two weeks in Kanagawa Prefecture and islands belonging to Tokyo Metropolis), at the main landing ports of each designated area. When sampling is conducted in markets, the area where fish was caught should be confirmed. Major species caught in each fishing season should be selected as the target species for inspection, taking the local circumstances into account. The species should be selected to cover a wide spectrum of marine habitat such as surface (e.g. Juvenile Japanese sand lance), middle column (e.g. sea bass, sea bream), and bottom (e.g. flounder, conger eel), taking into account the fact that larger amount of radioactive materials has so far been detected in species swimming in the surface (e.g. sand lance).
- (b) **Northern Part of Fukushima Prefecture and to the North:** Inspection should be conducted before resumption of fishery operations. Decision on whether to resume fishery operations should be based on the analysis of the results of the inspection. When fishery operation is resumed, Prefectural Governments should designate areas where inspection is necessary, and conduct sampling once a week in principle (once every two weeks in Iwate Prefecture and to the north), at the main landing ports of each designated area. Target species for inspection should be selected based on the procedure in (a) above.

2. Migratory species (skipjack, Japanese jack mackerel, Pacific saury, among others)

Inspection should be conducted through cooperation between relevant fisheries industry organizations and the Prefectural Governments where the fish is landed.

- (a) **Skipjack:** After the formulation of fishing grounds off the coast of Izu islands and Boso Peninsula (around middle of May), inspections should be conducted once a week in principle (sampling should be conducted at the fishing ports in Chiba Prefecture where landing of skipjack is expected (Choshi and Katsuura Fishing Ports)). When formation of fishing grounds off the coast of Fukushima Prefecture (usually 240-320 km off the coast) is expected (around early June), sampling by a trial fishing vessel should be conducted prior to commercial operations. Decision on whether to operate fishery in the area should be based on the analysis of the results. When fishery operation is to continue, sampling should be conducted once a week in principle at landing ports. When fishing grounds are formed off the coast of Miyagi Prefecture and to the north, inspections should be conducted once a week in principle.
- (b) **Sardines and mackerel:** While fishing grounds are formed off the coast of Chiba Prefecture, sampling should continue at the fishing ports in Chiba Prefecture where landing of sardines and mackerel is expected (Choshi Fishing Port). When formation of fishing grounds off the coast of Ibaraki Prefecture is expected (in May), sampling should be conducted by the research vessel of the Ibaraki Prefectural Fisheries Experimental Station, in cooperation with the Ibaraki Prefectural Government. Decision on whether to operate fishery should be based on the analysis of the results. When fishery operation is to continue, sampling should be conducted once a week in principle at landing ports. When formation of fishing grounds off the coast of Fukushima Prefecture is expected (in June), sampling should be conducted by a research fishing vessel. The rest of the procedure will be the same as described above. When fishing grounds are formed off the coast of Miyagi Prefecture and to the north, inspections should be conducted once a week in principle.
- (c) **Pacific saury and salmon migrating southward:** Starting from summer, inspections should be conducted once a week in principle.



3. Others

- (a) **Amount of sample:** Sample size should be sufficient enough to be able to conduct inspection, i.e. 5 kg or more per species in principle. The sampling date and site should be recorded.
- (b) **Additional requirements:** Due to the migratory nature of fish, and considering the varying weather conditions, sampling of target species at scheduled site and date may not always be possible. Therefore, sampling plans should be drawn up with ample flexibility to allow for these inclement weather conditions.
- (c) **Publication of inspection results:** Publication and reporting of the inspection results to the Ministry of Health, Labor and Welfare should be undertaken by the Prefectural Government in whose waters the samples were caught, or in which the sampling port is located.
- (d) **Response to inspection results that exceed the Provisional Regulation Value (PRV) in migratory species:** When inspection results exceed the PRV levels are detected in migratory species, the industry concerned will be requested to voluntarily refrain from relevant fishing operations around the site where the sample was obtained (generally on a prefecture by prefecture basis). Then, sampling by a research fishing vessel should be conducted once a week in principle. Fishery operations could resume only after inspection results are below the PRV levels for 3 consecutive times.

Box 2. Monitoring Programs and Control Measures Adopted by the Government of Japan to Ensure Safety of Fish and Fishery Products

1. Monitoring programs for fish and fishery products and restriction on fishing activities

- (1) **Provisional Regulatory Values (PRV) in Japan:** For the purpose of food safety, the Government of Japan sets the PRV for radioactive iodine and Cesium in fishery products at 2000 Bq/kg and 500 Bq/kg, respectively. Extensive and frequent samplings have been undertaken to ensure that no fishery products containing radioactive iodine and/or Cesium exceeding the PRV levels are distributed to the markets. Note: As shown in Table 2, Japan's PRV level for radioactive Cesium of 500 Bq/kg is rather conservative compared to those of other countries (e.g. USA is 1200 Bq/kg).

Box 2. Monitoring Programs and Control Measures Adopted by the Government of Japan to Ensure Safety of Fish and Fishery Products (Cont'd)

- (2) **Monitoring of fishery products:** The Fisheries Agency of Japan in coordination with relevant Prefectural Governments, has been conducting samplings to measure the levels of radioactive substances in fish and fishery products. The samplings have been carried out at major fishing ports at least once a week for each major target species. When result of a measurement detects a level exceeding the PRV, related fishing activities involving such species and its landings are immediately suspended. Note: The Basic Policy for Inspections on Radioactive Materials in Fishery products is shown in **Box 1**.
Taking into consideration the broad migration of some fish species, the Fisheries Agency in coordination with Prefectural Governments and related fisheries organizations, is undertaking samplings of fish and fishery products in wide areas from Hokkaido to Kanagawa Prefectures. Results of the sampling measurements are immediately posted on the websites of the Ministry of Health, Labor, and Welfare (MHLW) and that of the Fisheries Agency. Note: the results of the samplings as of 29 June 2011 are shown in **Table 1**. All the 57 samples except for 23 samples of freshwater fishes, found to exceed the PRV levels, were taken in the coastal areas close to the Fukushima NPP. The marine fish samples comprise limited species, *i.e.* epipelagic small fish (juvenile Japanese sand lance and juvenile anchovy), coastal bottom fish (fat greenling, brown hake, and stone flounder), invertebrates (Mediterranean mussel, North Sea urchin, surf clam, and Japanese mitten crab), and seaweeds (Wakame, Hijiki, and Arame seaweeds).
- (3) **Restriction on fishing activities and market distribution:** In case a sampling measurement indicates radioactive substances exceeding the PRV levels, related fishing activities in a certain fishing ground and landings of that species are immediately suspended. Such suspension can only be lifted after all sampling measurements at more than three samplings in the same spot during the last one month show levels below the PRV. Through such restrictive measures, no fishery products with radioactive substances exceeding the PRV levels are distributed to the markets.
- *Situation of fishing activities in coastal areas near Fukushima and around Fukushima as of 9 June 2011:*
 - **Fukushima Area:** No fishing activities have been conducted since the occurrence of the nuclear accidents in the Fukushima NPP.
 - **Miyagi Area:** Part of fishing activities resumed in early June, after all sampling results of species caught were confirmed that their levels of radioactive substances are below the PRV.
 - **Ibaraki Area:** Fishing activities for Japanese sand lance have been suspended since sampling measurements showed that the species in this area exceeded the PRV. Trawl fishing resumed after all sampling results of the species caught were confirmed that their levels of radioactive substances are below the PRV.
 - *Samplings for skipjack which is an important export marine fish species of Japan:* Skipjack migrates every June into the offshore areas of the east coast of Japan (240-320 km from the coastline). In mid-June 2011, samplings of skipjack taken in the experimental fishing offshore of Fukushima confirmed that the levels of radioactive substances were below the PRV. Therefore, fishing activities for skipjack in that area resumed since 22 June 2011. During the entire fishing season, samplings are to be continuously undertaken at major fishing ports once a week in principle.

2. Monitoring programs for seawater

The Ministry of Education, Culture, Sports, Science and Technology (MEXT) and TEPCO have been conducting monitoring programs to measure the levels of radioactive substances in seawaters and bottom sediments at over 100 sampling stations in the coastal and offshore areas in the vicinity of the Fukushima NPP. The results of the monitoring of seawaters show a decreasing trend in the levels of the radioactive substances. In particular, the results of the recent sampling measurements showed that regardless of whether the samples were taken from the surface, middle and bottom layers, the levels of radioactive substances in seawaters beyond the 30 km radius from the Fukushima NPP have been constantly below the detectable levels, *i.e.* 4 Bq/L of Iodine, 6 Bq/L for Cs-134, and 9 Bq/L for Cs-137 from the samplings by MEXT; and 7 Bq/L for Iodine, 15 Bq/L for Cs-134 and Cs-137 from the samplings by TEPCO in the area around the Fukushima NPP. Further, MEXT also conducted simulations of future diffusion and concentration of radioactive substances in seawaters, utilizing the oceanographic prediction system JCOPE-2 with oceanographic data such as ocean currents and water temperature. The results of the recent simulation showed that the levels of radioactive substances have become and will remain below the detectable levels in the offshore areas.

3. For smooth transaction and exports

While the safety of fish and fishery products from Japan on the market is secured through the monitoring efforts and restrictive measures, any trade partners may require certificates of measurement of radioactive substances in such products. Therefore, the Government of Japan has designated 30 inspection institutes in Japan which could provide the necessary certificates for any particular consignments of fish and fishery products. In addition, relevant Prefectural Governments with the assistance of the Fisheries Agency will install simplified radiation measuring instruments at major fishing ports to introduce the screening systems for fish landings in these ports.

4. Scientific consideration: Medium- and long-terms impact on fishery products

The major radioactive substances discharged from the Fukushima NPP are radioactive Iodine-131, and Cesium-134 and Cesium-137. The impact of these radioactive substances on saltwater fish is expected to be limited, considering the following scientific facts:

- (1) **Dilution and diffusion of radioactive materials in the sea:** Concentration levels of such radioactive substances are expected to rapidly and significantly decrease by dilution in the massive amount of seawaters and dispersion with seawater currents and swirls. Radioactive substances released into the sea are to fall down to the bottom sediment while being attached and absorbed into suspended particles, and in the long term, they are considered to be transported to the deep sea with average depth of 3800 meters, in this case, off the east coast of Japan.
- (2) **Bio-concentration of radioactive substances in saltwater fishes:** The radioactive half-life period of Iodine is 8 days. Therefore, even if fish intakes the radioactive Iodine into its internal organs, it diminishes very shortly. For this short half-life, the transfer of radioactive iodine from seafood to human bodies is unlikely. With regards to the radioactive Cesium, although it has a longer half-life period of 30 years, Cesium behaves like Potassium in fish bodies. As such, Cesium does not remain concentrated as it is excreted through the gills and in the urine as the levels of radioactive substances in the surrounding seawater decreases.

The level of radioactive Cesium in fish has a close proportional relationship to that in the surrounding seawater, and it is known that the level of radioactive Cesium in fish would decrease to around one-half in 50 days in the surrounding seawater with low levels of radioactive substances. This implies that measurement of radioactive substances in the seawater is important in estimating the levels of radioactive substances in fish. As mentioned above, most of the recent sampling measurements show that the levels of radioactive substances in the seawater at the surface, middle and bottom layers beyond the 30 km radius from the Fukushima NPP have been constantly below the limit of the detectable levels.

Benchmarking of the Thai National Shrimp Certification Scheme against the FAO Aquaculture Certification Guidelines

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Aquaculture has an important role to play in the global efforts to eliminate hunger and malnutrition by supplying fish and other aquatic products for human consumption. Aquaculture also makes significant contributions to poverty reduction by improving employment opportunities and increasing returns on resource use. Statistics have shown that in 2008, aquaculture accounted for 46% of the total food fish supply considering that the global food fish from aquaculture reached 52.5 million metric tons out of the 142.0 million metric tons of total fish production from capture fisheries and aquaculture (FAO, 2010). However, the rapid increase of aquaculture production and trade had also ushered in concerns regarding the potential negative impacts of aquaculture development on the environment, communities and consumers. Certification in aquaculture was therefore initiated as means of ensuring that the negative impacts of aquaculture are minimized, while the benefits to society and consumers are enhanced and confidence in aquaculture production and marketing is restored. Thailand being the top producer and exporter of aquaculture products especially shrimps recognized this need and developed the Thai National Shrimp Certification Scheme for its cultured shrimp to access the world market. Meanwhile, the FAO Guidelines on Aquaculture Certification had been recently promoted to serve as guide for the development and implementation of credible aquaculture certification schemes. Considering the existence of the Thai Scheme and the FAO Guidelines, the Department of Fisheries of Thailand initiated a benchmarking of the Thai Scheme against the FAO Guidelines to assess the extent for which the Thai Scheme could be aligned with the FAO Guidelines and minimize confusion among the country's aquaculture producers and exporters.

The results of the benchmarking clearly showed the compliance of the Thai Scheme with that of the FAO Aquaculture Certification Guidelines both in terms of critical and major requirements at acceptable levels. The four minimum substantive criteria such as animal health and welfare, food safety, environmental integrity, and socio-economic aspects including the institutional and procedural requirements such as standard setting, accreditation and certification of the FAO Guidelines are being complied to by the Thai National Shrimp GAP criteria. This could indicate that the result of the benchmarking of the two schemes has enabled a mutual recognition for the Thai National Shrimp Certification Scheme as conforming to the FAO Aquaculture Certification Guidelines. It is recommended that the benchmarking of the standard and/or certification of the Thai Scheme against the FAO Guidelines can be carried out by applying or modifying the methodology used as a tool for any benchmarking exercise. The results of the benchmarking could also be used as reference for the other countries in the ASEAN region and elsewhere in their efforts towards developing their respective aquaculture certification schemes, and be able to access the high-end market for their aquaculture products.

In view of the increasing world demand for food fish, aquaculture production has been given much attention in the last decade in terms of certification by both public and private sectors to ensure food safety and quality of aquaculture products, and that production takes into consideration environment-friendly methods, as well as concerns on animal health and welfare, and social responsibility. During this decade, a large number of public and private food standards and certification schemes have been promoted in fisheries and aquaculture, including those by many NGOs. These schemes have been borne out of a desire to improve the image of farmed fish and seafood as safe and sustainable alternative to wild capture fish, and are generally aimed at industry improving practices including reduction of the negative impacts of the production on the environment (Washington and Ababouch, 2011).

Nevertheless, the emergence of a wide range of certification schemes and accreditation bodies created confusion among producers and consumers alike. It was therefore deemed necessary to come up with more globally accepted norms

for aquaculture production, which could provide guidance and serve as basis for improved harmonization as well as facilitate mutual recognition and the establishment of equivalence between certification schemes.

It was towards this objective that the Food and Agriculture Organization of the United Nations (FAO) was requested during the 3rd Session of the Sub-Committee on Aquaculture to convene expert consultations and/or workshops to develop the guidelines on aquaculture certification (FAO, 2007). The development of such guidelines has taken four years through six expert consultations and one technical consultation, where the considerations were taken up during the 4th Session of the Sub-Committee on Aquaculture and subsequently adopted by the 5th Session of the Sub-Committee on Aquaculture. Finally, the Guidelines were endorsed by the 29th Committee on Fisheries in February 2011.

The FAO Guidelines on Aquaculture Certification also referred to as the FAO Guidelines contain provisions

and guidance for the development, organization and implementation of credible aquaculture certification schemes that cover four minimum substantive criteria, namely: a) animal health and welfare; b) food safety; c) environmental integrity; and d) socio-economic aspects associated with aquaculture (FAO, 2011). The FAO Guidelines also prescribe that under institutional and procedural requirements, credible aquaculture certification schemes should consist of three components: i) standard setting; ii) accreditation; and iii) certification. Each component should comprise minimum requirements that a body or entity should meet in order to be recognized as credible and reliable in executing the relevant duties and responsibilities. While **standard setting** encompasses the tasks of developing, monitoring, assessing, reviewing, and revising the standards, **accreditation** is an independent assessment of the competence of the certification body or entity, and **certification** is the procedure by which a body or entity gives written or equivalent assurance that the aquaculture operation or activity under consideration conforms to the relevant aquaculture certification standards.

In Thailand, the Thai National Shrimp Certification Scheme had been developed since the last decade. As a matter of fact, the World Bank (2005) mentioned that Thailand has taken a proactive strategy to access high-end markets

by building its national reputation as a producer of safe quality products. The strategy pursued by the Department of Fisheries of Thailand (DOF) consisted in developing two standards for sustainable shrimp aquaculture: the Code of Conduct (CoC) in 1998 and Good Aquaculture Practice (GAP) in 2000. These two standards have incorporated the various international standards including those from the *Codex Alimentarius*, ISO 14001 standard, and relevant FAO codes.

CoC and GAP are meant to address the environmental management issues in aquafarming systems and those of aquafarms' neighboring areas, shrimp disease control, as well as the concept of antibiotics-free shrimp production and traceability. Under the responsibility of the DOF, the development of such standards had been carried out through its Thai Quality Shrimp Program which encompassed not only the development of standard *per se* but also the certification systems for CoC and GAP. In 2008, the Thai National Shrimp Certification Scheme underwent a major change creating three entities responsible for standard setting, accreditation and certification. The Ministry of Agriculture and Cooperatives through the National Bureau of Agricultural Commodity and Food Standards (ACFS), a national standard setting body, formed a technical committee which initiated a review of the Thai National



Shrimp Standard using as basis the draft FAO Guidelines on Aquaculture Certification. Subsequently, the ACFS released the Thai Agricultural Standard (TAS 7401-2009) on Good Aquaculture Practices for Marine Shrimp Farms generally known as the new Thai Shrimp GAP or Thai National Shrimp GAP in 2009 (National Bureau of Agricultural Commodity and Food Standards, 2010). The DOF also reviewed its role in certification since 2008 with the Aquaculture Development and Certification Center (ADCC) serving as a certification body using ISO/IEC Guide 65 in setting up the certification system for Thai aquaculture shrimp and fish. The ACFS plays an important role in serving as an accreditation body using the ISO/IEC 17011 as basis for the development of the accreditation system (Thailand Industrial Standard Institute, 2004) which also applies to the shrimp certification scheme.

In order to establish the conformity of the requirements of the Thai National Shrimp Certification Scheme with the FAO Aquaculture Certification Guidelines, benchmarking was carried out through the initiatives of DOF. WTO (2007) considers benchmarking as significant and crucial as it could provide the means of comparing the requirements of various standards. Washington and Ababouch (2011) cited that the FAO Aquaculture Certification Guidelines provide minimum substantive requirements upon which any aquaculture certification scheme could be assessed for benchmarking any initiatives in setting aquaculture standards and certification. For instance, the Global Food Safety Initiative (GFSI) had recognized the alignment of the food safety elements of the GLOBAL G.A.P. of aquaculture and livestock schemes through benchmarking activities (GFSI, 2010). Moreover, the World Wide Fund for Nature (WWF) in its study on standards and certification schemes currently used in aquaculture, evaluated and benchmarked a wide range of schemes against a range of criteria including environmental impacts, social issues and animal welfares (WWF, 2007; Washington and Ababouch, 2011).

Benchmarking of the Thai Scheme against the FAO Guidelines

Objectives

In order to benchmark the Thai National Shrimp Certification Scheme against the FAO Aquaculture Certification Guidelines, the four minimum substantive criteria under the FAO Guidelines (animal health and welfare, food safety, environmental integrity, and socio-economic aspects) were considered, as well as the institutional and procedural requirements covering standard setting, accreditation and certification. It was envisaged that the comparative analysis resulting from the benchmarking exercise could indicate the extent of alignment of the Thai Scheme with the FAO Guidelines.

Methodology

The four minimum substantive criteria as well as the institutional and procedural requirements comprising standard setting, accreditation and certification in the FAO Aquaculture Certification Guidelines, were used as the template in the benchmarking exercise with the Thai National Shrimp Certification Scheme which embraces the Thai National Shrimp GAP, standard setting, accreditation and certification. During the benchmarking, the 10 requirements under Thai National Shrimp GAP (TAS 7401-2009): 1) farm site and registration; 2) farm management; 3) use of veterinary drugs and chemicals; 4) effluent and sediment management; 5) energy source and fuel; 6) farm sanitation; 7) harvest and post harvest handlings; 8) labour and welfare; 9) social and environmental responsibilities; and 10) record keeping (National Bureau of Agricultural Commodity and Food Standards, 2009), were examined and where applicable, re-grouped to correspond to the relevant aspects of the FAO Guidelines. Meanwhile, the institutional and procedural requirements such as standard setting, accreditation, and certification in the Thai National Shrimp Certification Scheme were directly benchmarked against the relevant requirements under the FAO Guidelines. It should be considered that such benchmarking was carried out in conformity with the four minimum substantive criteria as well as the institutional and procedural requirements. In this regard, Ababouch (pers comm.) suggested that the definitions of such criteria should distinguish the weights and relative importance of the various conformities in two levels as described in **Box 1**.

Box 1. Definition of the Criteria of Conformity of the Aquaculture Certification Scheme

Critical level: A criteria or requirement can be considered *critical* if it can **directly and negatively affect** the integrity of an aquaculture production system, including production, standard setting, accreditation, and certification. The critical concerns on production include for example unacceptable water quality which can lead to contamination of fish/shrimp, inappropriate farm site that can cause contamination of fish/shrimp, absence of or inadequate animal health management practices which can lead to disease. For accreditation, the critical concerns could include unqualified accreditor and non-transparent accreditation process. For certification, the critical concerns could include unqualified certifier, non-trained certifier, non-accredited certifier, among others. Confidentiality and independence are other key critical concerns being considered under both accreditation and certification requirements.

Major level: A criteria or requirement can be considered *major* if it does **not directly and negatively affect** the integrity of an aquaculture production system, including production, standard setting, accreditation, and certification. But if not corrected within reasonable time and occurs repeatedly, it can lead to negative impacts on the integrity of an aquaculture production system. The major concerns on production could include workers not fully trained, insufficiencies in record keeping, among others. For accreditation and certification, the major concerns include certain insufficiencies in record keeping.

Findings and Discussions

As envisaged, benchmarking was carried out in order to establish an equivalence and conformity between the Thai National Shrimp Certification Scheme with the FAO Aquaculture Certification Guidelines. The results of benchmarking considered the Thai Scheme as equivalent to the FAO Guidelines if such Scheme conforms with **all critical** requirements of the FAO Guidelines, and more than 90% of **the major** requirements (Ababouch pers comm.). Thus, in-depth interviews of key informants were conducted in order to obtain the necessary information with regards to shrimp culture operation, standard setting, accreditation, and certification. It should be noted that the Thai National Shrimp Certification Scheme contains the National Shrimp GAP or Standard, and institutional and procedural requirements covering standard setting, accreditation, and certification.

Thai National Shrimp GAP or Standard

The newly developed standard on Good Aquaculture Practices for Marine Shrimp Farm (TAS 7401-2009) was issued for use on a voluntary basis in 2009 in accordance with the Ministerial Notification of Agriculture and Cooperatives on 29 September 2009 (National Bureau of Agricultural Commodity and Food Standards, 2009). The summary of the requirements under the Thai National Shrimp GAP appears in **Box 2** while the requirements under the Thai National Shrimp GAP corresponding to each minimum substantive criteria of the FAO Guidelines are shown in **Box 3**. The institutional and procedural requirements of the Thai National Shrimp Certification Scheme are summarized hereafter under three aspects, namely: standard setting, accreditation, and certification.

Standard Setting

The National Bureau of Agricultural Commodity and Food Standards (ACFS) of the Ministry of Agriculture and Cooperatives established the steps in setting agricultural standard based on international standards especially the WTO principles taking into account transparency as the main aspect. For the establishment of marine shrimp standard, the nine-step procedures had been used based on the *Codex Alimentarius* (WHO and FAO, 2010) and Code of Practice for Fish and Fishery Products (FAO and WHO, 2009). The nine steps comprise: 1) identifying the agricultural/shrimp standard development; 2) appointing a technical committee for standard consideration; 3) drafting the standard; 4) reviewing of the standard by the technical committee; 5) seeking stakeholders' comments and public hearing; 6) submitting the standard to the policy committee for the review and submission to the Agricultural Standard



Committee; 7) notifying the WTO in case of mandatory standard; 8) approving of the standard and officially announcing the standard through Ministerial Notification; and 9) providing conditions for the review of the standard every five years or as requested by the stakeholders (National Bureau of Agricultural Commodity and Food Standards, 2010). After the establishment of the national shrimp standard was completed and coded as TAS 7401-2009, this was released for adoption since 2009.

The development of the Thai National Shrimp GAP or Thai Agricultural Standard on Good Aquaculture Practices for Marine Shrimp Farm (TAS 7401-2009) was conducted in a transparent way throughout its two years development process. A technical committee was established comprising all stakeholders involved in shrimp production such as specialists, scientists, and representatives of shrimp farmers, academia and shrimp processors. The technical committee revised the draft Thai National Shrimp GAP several times prior to seeking the stakeholders' comments and public hearing. Before eventually adopting the National Shrimp GAP, notification was made for three months to enable all stakeholders to provide comments. Records for the development of the said GAP including review documents and stakeholders' comments had been maintained.

However, it has been expected that within 1 to 2 years, there could be requests by key stakeholder(s) for revision of the Thai National Shrimp GAP particularly with respect to the FAO Guidelines. Nonetheless, it should be considered that almost all the requirements in the FAO Guidelines had already been complied with under the Thai National Shrimp GAP.

Accreditation

ACFS has been appointed by the Thai Cabinet since 29 November 2003 to be an accreditation body for agricultural assessment. The accreditation system developed by the ACFS was based on ISO/IEC 17011

Box 2. Summary of the Requirements under the Thai National Shrimp GAP

1. Farm site and registration
<p>1.1 Farms shall not be located in environment that has risks of contamination that affects shrimp health and safety of consumers</p> <p>1.2 Farms shall be located close to quality water suitable for shrimp culture</p> <p>1.3 Farms shall be conveniently accessible to transportation both outside and inside the farm, in order to provide convenient operation and rapid transportation of shrimps</p> <p>1.4 Farms shall be registered with the Department of Fisheries</p> <p>1.5 Farmers shall have legal land rights or other land use permits</p> <p>1.6 Farms shall be located outside mangroves and/or conserved wetland areas prescribed by laws</p> <p>1.7 Farms shall not be located in the prohibited area/zone prescribed by laws</p>
2. Farm management
<p>2.1 Manual of Farm Management should be made available and implemented</p> <p>2.2 Water testing from sources should be conducted in accordance to the specified time intervals in the manual</p> <p>2.3 Vacating and/or preparing pond between crops</p> <p>2.4 Stocking density of shrimp larvae shall be as appropriate, and record/certificate/health test report should be made available</p> <p>2.5 Inlet water should be filtered to prevent the entering of exotic species to pond</p> <p>2.6 Aerator or other aeration system shall be adequately placed in the pond</p> <p>2.7 Use of registered, good quality and not expired formulated feed, and in case feed is prepared on farm, feed ingredients should be clearly stated, while legally prohibited ingredients shall not be used</p> <p>2.8 Efficient feeding management shall be provided according to the requirements of shrimp culture</p> <p>2.9 Feed shall be stored in secured place to prevent contamination and its quality should be maintained</p> <p>2.10 Analysis of water quality in shrimp pond should be done on regular basis</p> <p>2.11 Preventive measures for predators and disease carriers entering the ponds during pond and water preparation, and shrimp culture should be in place</p> <p>2.12 Shrimp health should be monitored regularly</p> <p>2.13 In case shrimp shows sign of poor health and/or symptom, diagnosis, cause analysis and corrective actions should be carried out</p> <p>2.14 Preventive measures and control of disease outbreak should be in place</p> <p>2.15 In case of disease outbreak, farmer should inform the competent authority immediately</p>
3. Use of veterinary drugs, chemicals, hazardous substances and probiotics in aquaculture
<p>3.1 Veterinary drugs, chemicals, hazardous substances and probiotics used in aquaculture shall be registered with the competent authority and prudently used, while those prohibited by law shall not be used.</p> <p>3.2 In case authorized veterinary drugs or chemicals are applied prior to harvesting, withdrawal period shall be strictly followed or used according to the label instruction</p> <p>3.3 Veterinary drugs, chemicals, hazardous substances and probiotics shall be appropriately stored to prevent deterioration and danger</p>
4. Effluent and sediment management
<p>4.1 Quality of effluent shall be complied with relevant laws and regulations</p> <p>4.2 Effluent shall be treated or controlled its quality prior to discharge</p> <p>4.3 Preventive system of saline water discharged into freshwater area shall be in place for environmental protection</p> <p>4.4 Sediment shall not be disposed into public or non-permitted area</p>
5. Energy source and fuel
<p>5.1 Fuel and lubricants shall be stored properly and securely</p> <p>5.2 Machine used on farm shall be in good condition without any fuel or lubricant leakage to water source</p> <p>5.3 Used lubricant shall be disposed of in container and properly eliminated</p> <p>5.4 There shall be safe electricity system on farm</p> <p>5.5 Save use of energy and/or renewable energy sources</p>
6. Farm sanitation
<p>6.1 Garbage, refuse, veterinary drug containers and hazardous substances shall be separately managed to prevent cross-contamination</p> <p>6.2 Production inputs, materials and equipment should be kept in order so as not to harbour disease carrier animals/pests</p> <p>6.3 Bathroom and toilet shall be hygienically designed to prevent contamination to culture pond, canal and/or water source</p> <p>6.4 Manure shall not be used but if necessary, it shall be completely decomposed</p> <p>6.5 Pets should not be allowed in the production area</p>
7. Harvest and post-harvest handlings prior to distribution
<p>7.1 Prohibited chemicals shall not be used during harvesting, but if chemicals are used, it should be properly used in terms of type and quantity</p> <p>7.3 Select buyer/collector that has been certified in good hygienic practices of the post-harvest handling and transportation or registered with the Department of Fisheries</p> <p>7.4 Good hygienic practices on harvesting to prevent contamination</p>
8. Labor and welfare
<p>8.1 Farm workers shall be legally employed, and wages should be as prescribed by law.</p> <p>8.3 Welfare for workers shall be appropriately provided</p> <p>8.4 Provide precautions and working equipment for safe operation while workers shall be trained on safety of operation.</p>
9. Social and environmental responsibilities
<p>9.1 Farm shall site not obstruct the customary access and/or interfere with the living condition and activities of the local community</p> <p>9.2 Farmer should have good relationship with local community</p> <p>9.3 Join and participate in shrimp farm organizations or other related professional organizations</p> <p>9.4 Participate in conference or training on issues related to environment-friendly shrimp culture, shrimp health and animal welfare, and food safety.</p>
10. Record keeping
<p>10.1 Fry movement document (FMD) and Movement Document (MD) shall be presented upon request.</p> <p>10.2 Records shall be made on: use of veterinary drugs, chemicals, hazardous substances and probiotics; and use of chemicals during harvesting.</p> <p>10.3 Records on the relevant data/other necessary information shall be kept for further inspection</p>

Box 3. Thai National Shrimp GAP Requirements Categorized under Each Minimum Substantive Criteria of FAO Guidelines

FAO Minimum Substantive Criteria	Thai National Shrimp GAP Requirements
1. Animal health and welfare	<ol style="list-style-type: none"> 1. Farm management 2. Use of veterinary drugs, chemicals, hazardous substances and probiotics used in aquaculture 3. Labor and welfare 4. Social and environmental responsibilities
2. Food safety	<ol style="list-style-type: none"> 1. Farm site and registration 2. Farm management 3. Use of veterinary drugs, chemicals, hazardous substances and probiotics used in aquaculture 4. Farm sanitation 5. Harvest and post harvest handlings prior to distribution 6. Social and environmental responsibilities 7. Record keeping
3. Environmental integrity	<ol style="list-style-type: none"> 1. Farm site and registration 2. Farm management 3. Use of veterinary drugs, chemicals, hazardous substances and probiotics used in aquaculture 4. Effluent and sediment management 5. Energy source and fuel 6. Farm sanitation
4. Socio-economic aspects	<ol style="list-style-type: none"> 1. Labor and welfare

on Conformity Assessment – General Requirements for Accreditation Bodies Accrediting Conformity Assessment Bodies (Thailand Industrial Standard Institute, 2004). The requirements for accreditation cover four aspects, namely: i) accreditation body concerning legality, structure, impartiality, confidentiality, activity of accreditation body; ii) management including management system, document control, records, nonconformities and corrective actions, preventive actions, internal audits, management reviews, complaints; human resources covering personnel associated with the accreditation body, personnel involved in the accreditation process, monitoring, personnel records; iii) accreditation process concerning criteria and information, application on accreditation, subcontracting the assessment, preparation for assessment, document and record review, on-site assessment, analysis of findings and assessment report decision-making and granting accreditation, appeals, reassessment and surveillance, extending accreditation, suspending, and withdrawing or reducing accreditation; and iv) responsibilities of accreditation body.

As an accreditation body, the management of ACFS comprises the Accreditation Committee, Accreditation Review Panel, Appealing Committee (on *ad hoc* basis), Management Review Board, and Management Team responsible for matters related to the abovementioned requirements. With regards to the accreditation of the certification body, the ADCC of DOF is still undergoing the necessary processes and it is expected that the ADCC will be accredited by ACFS before the end of 2011.

Certification

The Aquaculture Development and Certification Center (ADCC) has been mandated by the Department of Fisheries

of Thailand to be responsible for the certification of fish and shrimp production and its products in accordance with shrimp and fish standards, *i.e.* CoC, GAP, and Thai National Shrimp GAP (TAS 7401-2009). The ADCC has adopted the ISO/IEC Guide 65 as basis for its certification and management since February 2010. ADCC has already developed a Quality Manual containing requirements that are in accordance with ISO/IEC Guide 65 such as the requirements for a certification body, *i.e.* impartiality, non-discrimination, independence; conditions and procedures for granting, maintaining, extending, suspending, and withdrawing certification; internal audit and management reviews, record keeping, confidentiality, certification body personnel; changes in certification requirements; appeals, complaints, disputes; application of certification; evaluation and its report; surveillance; use of licenses, certificates and marks of conformity; and complaints of suppliers (Thailand Industrial Standard Institute, 1996).

ADCC management comprises the Board of Directors, the Certification Committee, the Suspending/Withdrawal Committee, the Appealing Committee, Quality Management Representatives, and Management Team responsible for quality management, monitoring, auditing, certificate issuance, and administration. Since May 2010 the ADCC has conducted seven pilot auditing sub-units for shrimp and fish culture certification, which are located in five coastal and two freshwater aquaculture centers of DOF. Moreover, the application of certification based on ISO/IEC Guide 65 has already been applied nationwide to certify marine shrimp and Nile tilapia production. The ADCC, including the seven auditing sub-units, has submitted the request for an accreditation to ACFS since mid-March 2011. It is expected that ADCC and the seven auditing sub-units will

be ISO/IEC Guide 65 accredited by ACFS before the end of 2011. At the present, the DOF through the ADCC plans to subcontract the works related to certification to capable and credible private companies that are already ISO/IEC Guide 65 accredited. However, it is also important to note that based on national legislation, it is no longer necessary for a certification body such as ADCC which works under DOF, the competent authority, to be accredited by the ACFS. It is the DOF's choice to request an accreditation for ADCC in order to gain transparency and credibility of its certification system/body.

FAO Aquaculture Certification Guidelines¹

Minimum Substantive Criteria

There are four minimum substantive criteria under the FAO Aquaculture Certification Guidelines. These are: animal health and welfare, food safety, environmental integrity, and socio-economic aspects.

Animal Health and Welfare

This criterion is concerned with aquaculture activities conducted in a manner that assures the health and welfare of farmed aquatic animals by minimizing stress, reducing aquatic animal disease risks, and maintaining healthy culture environment throughout all phases of the production cycle. The requirements are set by the World Organisation for Animal Health (OIE) with specific normative basis. For this purpose, reference to animal welfare applies only insofar as it affects animal health consistent with the current and future OIE standards. The criterion focuses on aquatic animal health management in aquaculture operations, movement of aquatic animals and related products, culture environment concerned with animal health and welfare as well as risks reduction, responsible use of veterinary medicines, use of species in polyculture, and training of workers.

Food Safety

This criterion is concerned with aquaculture activities conducted in a manner that ensures food safety by implementing appropriate national or international standards and regulations including those defined by FAO/WHO *Codex Alimentarius*. Although the *Codex Alimentarius* cover both safety and quality issues concerning aquatic products, the FAO Guidelines mainly focused on the safety aspect but not much on the quality. The focus of this criterion is on aquaculture location, aquaculture operations, veterinary drugs and chemical use in aquaculture, water used in aquaculture, source of

broodstock, traceability and record keeping, hygienic conditions of aquaculture facilities and operations, monitoring, and training of the workers.

Environmental Integrity

This criterion focuses on the aquaculture practices in environmentally responsible manner in accordance with appropriate local, national and international laws and legislations, environmental impact assessment in aquaculture, environmental monitoring, evaluation and mitigation of adverse impacts on natural ecosystem, responsible wild seed collection, responsible use of feeds, chemicals, and veterinary drugs, exotic species, risk assessment of genetic materials of aquatic organism use, proper management of effluents, and responsible waste disposal.

Socio-economic Aspects

These criteria are concerned with aquaculture conducted in a socially responsible manner with national rules and regulations taking into consideration the International Labor Organization (ILO) convention on labor rights, not jeopardizing the livelihood of aquaculture workers and local communities. Socio-economic issues should be considered at all stages of aquaculture planning, development and operation. The importance of cooperative social responsibility from aquaculture to local communities should also be recognized.

The details of the criteria on animal health and welfare, food safety, environmental integrity as well as on the socio-economic aspects, and the corresponding sub-criteria are shown in **Table 1**.

Institutional and Procedural Requirements

The institutional and procedural requirements under the FAO Aquaculture Certification Guidelines comprise three major aspects. These are: standard setting, accreditation, and certification. The details of the criteria on standard setting, accreditation, and certification, and the corresponding sub-requirements are also shown in **Table 3**.

Standard Setting

Standard setting encompasses the tasks of developing, monitoring, assessing, reviewing, and revising standards. Its minimum requirements comprise transparency, participation by interested parties, content and comparable systems, notification provisions, keeping of records, review and revision of standards and of standard setting procedures, and validation of standards.

¹ FAO (2011)

Table 1. Benchmarking of Thai National Shrimp Certification Scheme against FAO Guidelines Based on Four Minimum Substantive Criteria

FAO Minimum Substantive Criteria		Level ^a	Thai National Shrimp GAP
1. Animal health and welfare			
1.1	Aquaculture operations should implement aquatic animal health management programs set up in compliance with relevant national legislations and regulations	C	✓
1.2	Movement of aquatic animals, animal genetic material and animal products should take place in accordance with the relevant provisions in the OIE Aquatic Animal Health Code	C	(✓) ^b
1.3	Culture environment should be maintained to benefit aquatic animal health and welfare, and reduce the risks of introduction and spread of aquatic animal diseases	C	(✓)
1.4	Veterinary medicines should be used in responsible manner and in accordance with applicable national legislations or relevant international agreements	C	✓
1.5	Use of species in polyculture or integrated multi-trophic aquaculture should be done with caution to reduce disease transmission between cultured species	M	none
1.6	Aquaculture species should be kept under farming conditions suitable for the species concerned	M	✓
1.7	Workers should be trained on good aquatic animal health and welfare management practices	M	(✓)
2. Food safety			
2.1	Aquaculture facilities should be located in areas where the risk of contamination is minimized and can be controlled or mitigated	C	✓
2.2	Aquaculture operations should include procedures for avoiding feed contamination in compliance with national regulations or as determined by internationally agreed standards	C	✓
2.3	All veterinary drugs and chemicals for use in aquaculture shall comply with national regulations, as well as international guidelines	C	✓
2.4	Water used for aquaculture should be of a quality suitable for the production of food which is safe for human consumption	M	✓
2.5	The source of broodstock and seed should not be source of carryover of potential human health hazards into the growing stocks	M	✓
2.6	Traceability and record-keeping of farming activities and inputs which impact food safety should be ensured	C	✓
2.7	Aquaculture facilities and operations should maintain good culture and hygienic conditions	M	✓
2.8	Proper management programs and relaying and depuration should be implemented in bivalve mollusks growing areas to prevent microbiological, chemical and reduce biotoxin contamination	C	n/a
2.9	Workers should be trained in good hygienic practices	M	(✓)
3. Environmental integrity			
3.1	Environmental impact assessments should be conducted, according to national legislations	C	✓
3.2	Regular monitoring of on-farm and off-farm environmental quality should be carried out	M	✓
3.3	Evaluation and mitigation of the adverse impacts on surrounding natural ecosystems	C	✓
3.4	Measures should be adopted to promote efficient water management and use as well as proper management of effluents	C	✓
3.5	Where possible, hatchery produced seed should be used, although wild seeds should be responsibly collected	M	n/a
3.6	Exotic species are to be used only when they pose an acceptable level of risk to the ecosystem health	M	(✓)
3.7	Science-based risk assessment should be used to address possible risks of using genetic material of an aquatic organism that has been altered	M	none
3.8	Infrastructure construction and waste disposal should be conducted responsibly	M	✓
3.9	Feeds, feed additives, chemicals, veterinary drugs including antimicrobials, manure and fertilizer should be used responsibly to minimize their adverse impacts	C	✓
4. Socio-economic aspects			
4.1	Workers should be treated in accordance with national labor rules and regulations and, relevant ILO conventions	C	✓
4.2	Workers should be paid wages and provided benefits and working conditions according to national laws and regulations	C	✓
4.3	Child labor should not be used in a manner inconsistent with ILO conventions and international standards	C	(✓)

^a **Critical level (C):** requirements that can directly and negatively affect the integrity of an aquaculture production system including institutional and procedural requirements. **Major level (M):** requirements that does not directly and negatively affect the integrity of an aquaculture production system and institutional and procedural requirements. But if not corrected within reasonable time and occurs repeatedly, it can lead to negative impacts on the integrity of an aquaculture production system.

^b (✓) means that the relevant requirement has already been in practice although such aspect has not been specified as requirements in the Thai National Shrimp GAP.



Accreditation

Accreditation is an independent assessment of the competence of the certification body or entity. Its minimum requirements include non-discrimination; independence, impartiality and transparency; human and financial resources; accountability and reporting; resolution of complaints concerning accreditation of certifying bodies; confidentiality; maintenance and extension of accreditation; suspension and withdrawal of accreditation; change in the accreditation requirements; and proprietor or license of an accreditation symbol, label or a logo.

Certification

Certification is the procedure by which a body or entity gives written or equivalent assurance that the aquaculture operation or activity under consideration conforms to the relevant aquaculture certification standards. Its minimum requirements include independence and impartiality; non-discrimination; human and financial resources; accountability and reporting; certification fees; confidentiality; maintenance of certification; renewal of certification; suspension and withdrawal of certification; maintaining the chain of custody; use and control of a certification claim, symbol, label or a logo; resolution of complaints, record keeping on complaints; and appeals concerning certification.

Results of Benchmarking of the Thai Scheme against the FAO Guidelines

As envisioned, the main objective of benchmarking the Thai National Shrimp Certification Scheme or Thai Scheme against the FAO Aquaculture Certification Guidelines or

FAO Guidelines is to determine the extent for which the Thai Scheme could be aligned with the FAO Guidelines, and eventually to enable the Thai Scheme to gain recognition and equivalence as the standard for aquaculture. The results of the benchmarking could also serve as reference for the other countries in the ASEAN region in their efforts towards developing their respective credible aquaculture certification schemes. The results of the benchmarking are grouped into the Minimum Substantive Criteria comprising four aspects with corresponding sub-criteria, and the Institutional and Procedural Requirements comprising three requirements and corresponding sub-requirements. Each sub-criteria and sub-requirements are categorized into critical and major levels depending on whether these directly or indirectly affect negatively the integrity of an aquaculture production system including the institutional and procedural requirements.

Minimum Substantive Criteria

The results of the benchmarking of the four minimum substantive criteria between the Thai Scheme and the FAO Guidelines are shown in **Table 1** where the compliance and non-compliance at critical and major levels are indicated. The summary of the result of benchmarking of the four minimum substantive criteria, *i.e.* animal health and welfare, food safety, environmental integrity, and socio-economic aspects is shown in **Table 2**.

Regarding the first criteria on animal health and welfare (Criteria 1, Tables 1 and 2), it can be seen that the Thai Scheme has complied with the four critical sub-criteria 1.1 to 1.4 of the FAO Guidelines concerning the

implementation of aquatic health management, movement of aquatic animals, a culture environment and responsible use of veterinary medicines. For the three major sub-criteria 1.5 to 1.7 the Thai scheme conforms to the two sub-criteria 1.6 and 1.7 concerning suitable farming conditions and workers' training on good aquatic animal health and welfare management.

It should be noted that sub-criteria 1.2, 1.3, and 1.7 on the implementation of aquatic animal health management, movement of aquatic animal and related genetic materials/products as well as workers' training on the good aquatic animal health and welfare management have already been practiced in Thailand as imposed by the Department of Fisheries (DOF) regulations even with the absence of specific text in the GAP guidelines. It is therefore suggested that in the future revision of the Thai National Shrimp GAP by the standard setting body or ACFS, these concerned practices should be taken into consideration and correspondingly included in the requirements.

For the food safety criteria (Criteria 2, Tables 1 and 2), the Thai Scheme conforms to all four critical sub-criteria 2.1, 2.2, 2.3 and 2.6 of the FAO Guidelines concerning the locality and contamination control of aquaculture facilities, safeguarding feed contamination in aquaculture operations, the use of veterinary drugs and chemicals, and traceability and record keeping. However, it should be noted that sub-criteria 2.8 concerning bivalve mollusks had been considered not applicable. Moreover, the Thai Scheme is also in compliance with all four major sub-criteria 2.4, 2.5, 2.7 and 2.9 of the FAO Guidelines concerning water quality use for aquaculture, source of quality broodstock and seed, good culture and hygienic conditions of aquaculture facilities and operations. As indicated in Table 1, the sub-criteria 2.9 concerning workers' training in good hygienic practices has already been practiced under the Thai Scheme but it is not indicated in the text. The standard setting body such as the ACFS should take this into consideration for possible adjustment of the guidelines to include the missing text in the next revision of the Thai Scheme.



In terms of environmental integrity (Criteria 3, Tables 1 and 2), the Thai Scheme complies with four critical sub-criteria 3.1, 3.3, 3.4, and 3.9 of the FAO Guidelines concerning environmental impact assessment of aquaculture operations according to national legislation, evaluation and mitigation of adverse impacts on surrounding national ecosystems, efficient water use and management including effluent management, and responsible use of feeds, feed additives, chemicals, veterinary drugs, antimicrobials, manure and fertilizer. The Thai Scheme also conforms to three out of five major sub-criteria 3.2, 3.6, and 3.8 concerning regular farm monitoring on environmental quality, the use of exotic species only when reaching an acceptable level of risk to the ecosystem health, and responsible waste disposal of infrastructure construction. In fact, the concern on the introduction of exotic shrimp species in 3.6, particularly the white shrimp (*Peneaus vanamei*) has already been in practice but not been written in the GAP guidelines. Moreover, the concern under major sub-criteria 3.7 on the application of the science-based risk assessment should be

Table 2. Summary of the Results of Benchmarking of the Minimum Substantive Criteria of the Thai National Shrimp GAP against the FAO Aquaculture Certification Guidelines

Criteria	Critical level		Major level	
	FAO	Thai	FAO	Thai
Animal Health and Welfare	4	4	3	3
Food Safety	5	4 + 1 na	4	4
Environmental Integrity	4	4	5	3 + 1 na
Socio-economic Aspects	3	3	-	-
Total	16	15 (+ 1 na)	12	10 (+1 na)

taken into consideration in the future works under the Thai Scheme. Therefore, the two sub-criteria 3.6 and 3.7 should be considered in the revision of the standard by the ACFS. Nonetheless, the issue regarding wild seeds collection under the sub-criteria 3.5 is not applicable to the shrimp culture in Thailand.

For the socio-economic aspects (Criteria 4, Tables 1 and 2), the Thai Scheme practically complies with all three critical sub-criteria (4.1 to 4.3) of the FAO Guidelines. Specifically, the aspects of responsible treatment to workers as well as the paid wages and benefit provision are already included in the Thai Scheme based on the Thai Labor Protection Act B.E. 2541—A.D. 1998, Revised (Labor Protection and Welfare Department, 2010) in accordance with relevant ILO convention. The issue on child labor under 4.3 has also been addressed particularly in Thailand under the Ministerial Notification of the Ministry of Labor complying ILO convention, 1973, No. 138 on minimum age and ILO Convention, 1999 No.182 on worst form of child labor. However, while the first two aspects have already been captured in the text form of the Thai Scheme, it is important to include the written text reflecting child labor issues in aquaculture to be complied with the two ILO conventions in the future revision of the Thai National Shrimp GAP Guidelines.

Institutional and Procedural Requirements

The results of the benchmarking of the institutional and procedural requirements between the Thai Scheme and the FAO Guidelines are shown in **Table 3** depicting the compliance of the requirements in both critical and major levels. **Tables 4, 5** and **6** show the summary of the compliance of the requirements in terms of standard setting, accreditation and certification, respectively.

Standard Setting

The results of benchmarking the requirements on standard setting are shown in **Table 3** and **Table 4**. There are 15 sub-requirements for standard setting that are both critical and major, concerning transparency, participation by interested parties, content and comparable systems, notification provision, keeping of records, review and revision of standards and standards setting procedures, and validation of standards. The Thai Scheme complies with eleven critical and four major sub-requirements of the FAO Guidelines. As a matter of fact, the standard setting of the Thai Scheme was based on the *Codex Alimentarius* and Code of Practice for Fish and Fishery Products which are in accordance with the normative basis of the FAO Guidelines. The development of Thai Scheme has been transparent throughout the two years of development process. The technical committee

had been established comprising all stakeholders involved in shrimp production such as specialists, scientists, as well as representatives from the shrimp farmers, the academia, and shrimp processors.

The technical committee reviewed the draft Thai national shrimp GAP several times prior to submitting the Scheme for stakeholders' comments and public hearing. Thus, before adopting the national shrimp GAP, a notification was advocated to all stakeholders for three months requesting for their comments. Records regarding the GAP setting including review documents, stakeholders' comments were kept and maintained. Nevertheless, as a result of the recent adoption of the FAO Aquaculture Certification Guidelines by the 29th COFI in February 2011, the ACFS might be requested by key stakeholder(s) to revise the Thai National Shrimp GAP, after its adoption for 1 to 2 years, in order to follow the same format as that of the FAO Guidelines although most of the requirements had already been complied with under the Thai Scheme.

Accreditation

Results of the benchmarking on accreditation between the two schemes are shown in **Table 3** and **Table 5**. As shown in **Table 3**, there are 15 critical and 20 major sub-requirements under the requirement on accreditation. The 15 critical sub-requirements concern the non-discrimination; independence, imparity, and transparency; human and financial resources; accountability and reporting; resolution of complaints accreditation of certifying bodies; confidentiality; and suspension and withdrawal of accreditation. The 20 major sub-requirements include human and financial resources; accountability and reporting; resolution of complaints accreditation of certifying bodies; maintenance and extension of accreditation; change in the accreditation requirement; and proprietor or license of an accreditations symbol, label or a logo. As a result of benchmarking, it could be gleaned that the Thai Scheme has complied with all the critical and major sub-requirements. This is due to the fact that the Thai accreditation body or ACFS has been using the same normative basis, *i.e.* ISO/IEC 17011 as that of the FAO Aquaculture Certification Guidelines.

Certification

The results of benchmarking the requirement on certification of the two schemes are shown in **Tables 3** and **6**. There are 22 critical sub-requirements which the Thai Scheme conforms with which include independence and impartiality; non-discrimination; human and financial resources; accountability and reporting; confidentiality; maintenance of certification; suspension and withdrawal of certification; use and control of certification claim, symbol, label or a logo; resolution of complaints and

Table 3. Benchmarking of Thai National Shrimp Certification Scheme against the FAO Guidelines on Institutional and Procedural Requirements

FAO Institutional and Procedural Requirements	Level ^a	Thai National Shrimp GAP
1. Standard Setting		
1.1 Transparency		
1.1.1 Transparency in the setting of standards is essential.	C	✓
1.1.2 Standard setting body should carry out activities in a transparent fashion, following written rules of procedure.	C	✓
1.1.3 On a regular basis as appropriate, the standard setting body should publicize its work programme as widely as possible.	M	✓
1.1.4 On the request of any interested party, the standards setting body should provide within reasonable time, a copy of standard setting procedures, work program, draft or final standards.	M	✓
1.1.5 Based on the needs of users, standard setting body should translate the standard setting procedures, work program, draft or final standards into appropriate languages.	M	✓
1.2 Participation by interested parties		
1.2.1 Standards setting body should strive to achieve balanced participation by independent technical experts and by representatives of interested parties in the standards development, revision and approval process.	C	✓
1.2.2 Interested parties should be associated in the standard setting process through an appropriate consultation forum or appropriate alternative mechanisms.	C	✓
1.3 Content and comparable systems		
1.3.1 The standards setting process should seek to include international reference standards and agreement, identify needs to fill gap review comparable systems and encourage mutual recognition among certification schemes.	C	✓
1.4 Notification provisions		
1.4.1 Before adopting standard(s), the standards setting body should allow a period of an appropriate duration for the submission of comments on the draft standards by interested parties.	C	✓
1.4.2 Standards setting body should take into account the comments received during the period for comments.	C	✓
1.5 Keeping of records		
1.5.1 Proper records of standards and development activity should be prepared and maintained.	C	✓
1.6 Review and revision of standards and of standards setting procedures		
1.6.1 Standards should be reviewed at regular basis and published in intervals in consultation with appropriate stakeholders.	C	✓
1.6.2 Proposals for revisions can be submitted by any interested party and should be considered through a consistent and transparent process.	C	✓
1.6.3 The procedural and methodological approach for setting standards should also be updated.	M	✓
1.7 Validation of standards		
1.7.1 In developing and revising standards, an appropriate procedure should be put in place to corroborate the standard vis-à-vis the minimum requirements for aquaculture as laid out in these guidelines.	C	✓
2. Accreditation		
2.1 Non-discrimination		
2.1.1 Access to the services of the accreditation body should be open to all certification entities irrespective of their location.	C	✓
2.1.2 Full recognition should be given to the special circumstances and requirements of certification bodies in developing countries and countries in transition.	C	✓
2.2 Independence, impartiality and transparency		
2.2.1 The accreditation body should be independent and impartial.	C	✓
2.3 Human and financial resources		
2.3.1 The accreditation body should have adequate financial resources and stability for the operation of an accreditation system.	C	✓
2.3.2 The accreditation body should employ a sufficient number of personnel having the necessary training, technical knowledge and experience for performing accreditation functions in aquaculture.	C	✓

Table 3. Benchmarking of Thai National Shrimp Certification Scheme against the FAO Guidelines on Institutional and Procedural Requirements (*Cont'd*)

FAO Institutional and Procedural Requirements	Level ^a	Thai National Shrimp GAP
2.3.3 Information on the relevant qualifications, training and experience of each member of the personnel involved in the accreditation process should be maintained and kept up to date.	M	✓
2.3.4 When an accreditation body decides to sub-contract work, the requirements for such an external body should be no less than for the accreditation body itself.	C	✓
2.4 Accountability and reporting		
2.4.1 The accreditation body should be a legal entity and should have clear and effective procedures for handling applications for accreditation procedures.	C	✓
2.4.2 A properly documented contractual or equivalent agreement describing the responsibilities of each party should be drafted.	M	✓
2.4.3 The accreditation body should have defined objectives and commitment, procedures and instructions in a quality manual and established effective system for quality.	M	✓
2.4.4 The accreditation body should conduct periodic internal audits covering all procedures in a planned and systematic manner.	C	✓
2.4.5 The accreditation body may receive external audits on relevant aspects. The results of the audit should be accessible by the public.	M	✓
2.4.6 Qualified personnel, attached to the accreditation body, should be nominated by the accreditation body .	C	✓
2.4.7 Personnel nominated for the assessments should provide the accreditation body with a report of its findings as to the conformity of the body assessed to all of the accreditation requirements.	M	✓
2.4.8 The accreditation body should have policy and procedures for retaining records of what happened during the assessment visit for a period consistent with its contractual, legal or other obligations.	M	✓
2.5 Resolution of complaints concerning accreditation of certifying bodies		
2.5.1 The accreditation body should have a written policy and procedures for dealing with any complaints.	C	
2.5.2 The procedures should include establishment, of an independent and impartial committee to respond to a complaint.	C	
2.5.3 The accreditation body should keep a record of all complaints, and take appropriate corrective.	C	
2.5.4 Information on procedures for handling complaints concerning accreditation should be made publicly available.	M	✓
2.5.5 This does not exclude recourse to other forms of legal and administrative processes as provided for in national legislation or international law.	M	✓
2.6 Confidentiality		
2.6.1 The accreditation body should have adequate arrangements, consistent with applicable laws, to safeguard confidentiality of the information obtained in the course of its accreditation activities at all levels of its organization.	C	✓
2.6.2 Where the law requires information to be disclosed to a third party, the body should be informed of the information provided, as permitted by the law.	C	✓
2.7 Maintenance and extension of accreditation		
2.7.1 The accreditation body should have arrangements to define the period of accreditation of a certifying body, with clear monitoring procedures.	M	✓
2.7.2 The accreditation body should have arrangements to ensure that an accredited certification body informs it without delay of changes in any aspects of its status or operation.	M	✓
2.7.3 The accreditation body should have procedures to conduct reassessments in the event of changes significantly affecting the capabilities or scope of activities of the accredited body.	M	✓
2.7.4 Accreditation should be re-assessed at sufficiently close intervals to verify that the accredited certification body continues to comply with the accreditation requirements.	M	✓
2.8 Suspension and withdrawal of accreditation		
2.8.1 The accreditation body should specify the conditions under which accreditation may be suspended or withdrawn, partially or in total, for all or part of the scope of accreditation.	C	✓
2.9 Change in the accreditation requirements		
2.9.1 The accreditation body should give due notice of any changes it intends to make in its requirements for accreditation to all stakeholders involved.	M	✓

Table 3. Benchmarking of Thai National Shrimp Certification Scheme against the FAO Guidelines on Institutional and Procedural Requirements (*Cont'd*)

FAO Institutional and Procedural Requirements	Level ^a	Thai National Shrimp GAP
2.9.2 It should take account of views expressed by interested parties before deciding on the precise form and effective date of the changes.	M	✓
2.9.3 It should verify that each accredited body carries out any necessary adjustments to its procedures within such time as, in the opinion of the accreditation body, is reasonable.	M	✓
2.9.4 Special considerations should be given to accredited bodies in developing countries and countries in transition, without compromising the integrity of the certification process.	M	✓
2.10 Proprietor or licensee of an accreditation symbol, label or a logo		
2.10.1 The provisions on the use and control of a certification claim, symbol, label or logo are addressed in the following section on certification.	M	✓
2.10.2 The accreditation body that is proprietor or licensee of a symbol or logo, intended for use under its accreditation program, should have documented procedures describing its use.	M	✓
2.10.3 The accreditation body should not allow use of its accreditation mark or logo in any way that implies that the accreditation body itself approved a product, service or system certified by a certification body.	M	✓
2.10.4 The accreditation body should take suitable action to deal with incorrect references to the accreditation system.	M	✓
3. Certification		
3.1 Independence and impartiality		
3.1.1 The certification body should be legally, financially independent from the owner of the certification scheme and have no any conflict of interest.	C	✓
3.1.2 The certification body should have no commercial, financial or any other interest in the aquaculture operation to be assessed other than for its certification services.	C	✓
3.1.3 The certification body should ensure that the personnel who conduct assessment in view of certification are different from the personnel which grant the certificate.	C	✓
3.1.4 The certifying body should not delegate authority for granting, maintaining, extending, reducing, suspending or withdrawing certification to an outside person or body.	C	✓
3.2 Non-discrimination		
3.2.1 Access to the services of the certification body should be open to all types of aquaculture operations.	C	✓
3.2.2 Access to the certification body should not be conditional upon the size or scale of the aquaculture operations.	C	✓
3.3 Human and financial resources		
3.3.1 The certification body should have adequate financial resources and stability for its conduct operations and/or activities.	C	✓
3.3.2 The certification body should employ a sufficient number of personnel having the necessary qualifications for performing conformity and/or chain of custody assessments in aquaculture.	C	✓
3.3.3 Information on the relevant qualifications, of the personnel involved in the certification process should be maintained by the certification body and kept up to date.	M	✓
3.3.4 When a certification body decides to sub-contract work, the requirements for such an external body should be no less than for the certification body itself.	C	✓
3.4 Accountability and reporting		✓
3.4.1 The certification body should be a legal entity having clear and effective procedures for handling applications for certification of aquaculture operations.	C	✓
3.4.2 A properly documented contractual describing the rights and duties of each party should be drafted between the certification body and its clients.	M	✓
3.4.3 The certification body should conduct periodic internal audits covering all procedures in a planned and systematic manner.	C	✓
3.4.4 The certification body may receive external audits on relevant aspects. The results of the audits should be accessible by the public.	M	✓
3.4.5 The certification body should have a policy and procedures for retaining records for a period consistent with its contractual, legal or other obligations.	M	✓
3.4.6 The certification body should make appropriate, non-confidential documents available on request.	M	✓

Table 3. Benchmarking of Thai National Shrimp Certification Scheme against the FAO Guidelines on Institutional and Procedural Requirements (*Cont'd*)

FAO Institutional and Procedural Requirements	Level ^a	Thai National Shrimp GAP
3.5 Certification fees		
3.5.1 If the certification body charges fees, it should maintain a written fee structure for applicants and certified aquaculture operations that should be available on request.	M	na
3.6 Confidentiality		
3.6.1 The certification body should have adequate arrangements, consistent with applicable laws, to safeguard confidentiality of the information obtained in the course of its certification at all levels of its organization.	C	✓
3.6.2 Where requires information to be disclosed to a third party, the client should be informed of the information provided, as permitted by the law.	C	✓
3.7 Maintenance of certification		
3.7.1 The certification body should carry out periodic surveillance and monitoring at appropriate intervals to verify that certified aquaculture operations continue to comply with the certification requirements.	M	✓
3.7.2 The certification body should require the client to notify it promptly of any intended changes to the management of the aquaculture.	C	✓
3.7.3 The certification body should have procedures to conduct reassessments in the event of changes significantly affecting the status and management of the certified aquaculture operation.	M	✓
3.7.4 The period of validity of a certificate should not exceed five years. The assessment required for re-certification should give particular attention to changes made in the conduct of the aquaculture operation or in the management practices.	M	✓
3.8 Renewal of certification		
3.8.1 On the basis of proper monitoring and auditing, the validity of certification should be renewed for an agreed period, not to exceed five years.	M	✓
3.9 Suspension and withdrawal of certification		
3.9.1 The certification body should specify the conditions under which certification may be suspended or withdrawn, partially or in total, for all or part of the scope of certification.	C	✓
3.9.2 The certification body should require that a certified aquaculture operation suspension or withdrawal of its certification discontinues use of all advertising matter and returns any certification documents.	C	✓
3.10 Maintaining the chain of custody		
3.10.1 All certified aquaculture products must be identified and differentiated from non-certified aquaculture products.	M	✓
3.10.2 The certification body should ensure that a recipient of certified aquaculture products should maintain pertinent chain of custody records, including all records relating to shipment, receipt and invoicing.	M	✓
3.10.3 The certification body should have documented procedures defining auditing methods and periodicity of audits.	M	✓
3.10.4 All inspection/audit records should be incorporated into a written inspection/audit report .	M	✓
3.10.5 The inspection/audit report should contain, as a minimum.	M	✓
3.11 Use and control of a certification claim, symbol, label or a logo		
3.11.1 The owner of the certification scheme should have documented procedures describing the requirements, restrictions or limitations on the use of symbols, labels or logos indicating that an aquaculture product comes from a certified aquaculture operation.	C	✓
3.11.2 The owner of the certification scheme should not issue any license to affix its mark/claim/label/logo or issue any certificate for any aquaculture operations or products unless it is assured that the product bearing it is in fact produced from certified sources.	C	✓
3.11.3 The certification body, accreditation body or owner of the certification scheme is responsible that no fraudulent or misleading use is made with the use and display of its certification mark, labels or logos.	M	✓
3.11.4 The aquaculture operation and any aquaculture product from it may use the specified symbol, label or logo only as authorized in writing by it.	M	✓
3.11.5 The certification body, accreditation body or owner of the certification scheme should take suitable action to deal with incorrect references to the certification system or misleading use of symbols, labels and logos found in advertisements and catalogues.	M	✓

Table 3. Benchmarking of Thai National Shrimp Certification Scheme against the FAO Guidelines on Institutional and Procedural Requirements (*Cont'd*)

FAO Institutional and Procedural Requirements	Level ^a	Thai National Shrimp GAP
3.11.6 All certificates issued should include necessary information to clearly indicate validity of certified aquaculture operator.	M	✓
3.12 Resolution of complaints, record keeping on complaints and appeals concerning certification		
3.12.1 The accreditation body or owner of the certification scheme should have written policy and procedures, applicable to accredited certification bodies, for dealing with any complaints and appeals from involved parties.	C	✓
3.12.2 The procedures should include an independent and impartial committee to respond to any complaint.	C	✓
3.12.3 Does not exclude recourse to other forms of legal and administrative processes as provided for in national and regional legislation or international law.	C	✓
3.12.4 The certification body, accreditation body or promoter/owner of the certification scheme should keep a record of all complaints and appeals take appropriate corrective and preventive action and safeguard confidentiality of information obtained .	C	✓
3.12.5 Information on procedures for handling of complaints and appeals concerning certification should be made publicly available.	M	✓

^a **Critical level (C):** requirements that can directly and negatively affect the integrity of an aquaculture production system including institutional and procedural requirements. **Major level (M):** requirements that does not directly and negatively affect the integrity of an aquaculture production system and institutional and procedural requirements. But if not corrected within reasonable time and occurs repeatedly, it can lead to negative impacts on the integrity of an aquaculture production system.

appeals. Moreover, out of 20 corresponding major sub-requirements the Thai Scheme is in compliance with 19 covering the sub-requirements on human and financial resource; accountability and reporting; maintenance of certification; renewal of certification; maintaining the chain of custody; use and control of a certification claim, symbol, label or a logo; and resolution of complaints and appeals. The other major sub-requirement on the certification fees is not applicable to the Thai Scheme as the Thai certification body ADCC is a government agency of the Department of Fisheries, which does not charge any certification fee. Nonetheless, in the future when the certification scheme would be sub-contracted to other parties, certification fees structure will be required according the requirements outlined in 3.5.

In summary, the results of the benchmarking of the four minimum substantive criteria, *i.e.* animal health and welfare, food safety, environmental integrity, and socio-economic aspects as well as the three requirements for standard setting, accreditation, and certification appear in **Table 7**. The results show that the Thai National Shrimp Certification Scheme has been in compliance with 63 out of 64 critical sub-requirements of the FAO Aquaculture Certification Guidelines. Only one critical sub-criterion on food safety is not applicable as it is related to bivalve mollusks farming but not on shrimp aquaculture. As for the major requirements and criteria, the Thai Scheme is in compliance with 53 out of 56 sub-requirements of the FAO Guidelines representing 94.6% of the total compliance. There are two sub-requirements under the environmental integrity and certification that are not applicable to the Thai

Scheme which concern about the collection of wild seeds and certification fees.

Conclusion and Recommendations

Conclusion

The results of the benchmarking clearly showed the compliance of the Thai Scheme with that of the FAO Aquaculture Certification Guidelines both in terms of critical and major requirements at acceptable levels. The four minimum substantive criteria, *i.e.* animal health and welfare, food safety, environmental integrity, and socio-economic aspects of the FAO Guidelines are being complied to by the Thai National Shrimp GAP criteria. The development of Thai standard setting by the ACFS has been carried out in a transparent manner, with the participation of all stakeholders and others following



Table 4. Summary of Benchmarking Results of Standard Setting of the Thai National Shrimp GAP against the FAO Aquaculture Certification Guidelines

Criteria	Critical level		Major level	
	FAO	Thai	FAO	Thai
1. Transparency	2	2	3	3
2. Participation by interested parties	2	2	-	
3. Content and comparable systems	1	1	-	
4. Notification provision	2	2	-	
5. Keeping of records	1	1	-	
6. Review and revision of standards and standards setting procedures	2	2	1	1
7. Validation of standards	1	1	-	-
Total	11	11	4	4

Table 5. Summary of Benchmarking Results of Accreditation of the Thai National Shrimp GAP against the FAO Aquaculture Certification Guidelines

Criteria	Critical level		Major level	
	FAO	Thai	FAO	Thai
1. Non-discrimination	2	2	1	-
2. Independence, impartiality, and transparency	1	1	-	-
3. Human and financial resources	3	3	1	1
4. Accountability and reporting	3	3	5	5
5. Resolution of complaints concerning accreditation of certifying bodies	3	3	2	2
6. Confidentiality	2	2	-	-
7. Maintenance and extension of accreditation	-	-	4	4
8. Suspension and withdrawal of accreditation	1	1	-	-
9. Change in the accreditation requirement	-	-	4	4
10. Proprietor or license of an accreditations symbol, label or a logo	-	-	4	4
Total	15	15	20	20

Table 6. Summary of Benchmarking Results of Certification of the Thai National Shrimp GAP against the FAO Aquaculture Certification Guidelines

Criteria	Critical level		Major level	
	FAO	Thai	FAO	Thai
1. Independence and impartiality	4	4	-	-
2. Non-discrimination	2	2	-	-
3. Human and financial resources	3	3	1	1
4. Accountability and reporting	2	2	4	4
5. Certification fees	-	-	1	na
6. Confidentiality	2	2	-	-
7. Maintenance of certification	1	1	3	3
8. Renewal of certification	-	-	1	1
9. Suspension and withdrawal of certification	2	2	-	-
10. Maintaining the chain of custody	-	-	5	5
11. Use and control of a certification claim, symbol, label or a logo	2	2	4	4
12. Resolution of complaints, record keeping on complaints and appeals concerning certification	4	4	1	1
Total	22	22	20	19 + (1 na)

Table 7. Summary of Benchmarking Results of Minimum Substantive Criteria and Requirements of Standard Setting, Accreditation, and Certification of the Thai National Shrimp GAP against the FAO Aquaculture Certification Guidelines

Requirements/criteria	Critical level		Major level	
	FAO	Thai	FAO	Thai
1. Minimum substantive criteria	16	15 + 1 na	12	10 + 1 na
2. Standard setting	11	11	4	4
3. Accreditation	15	15	20	20
4. Certification	22	22	20	19 + (1 na)
Total	64	63 + (1 na)	56	53 + (2 na)

the *Codex Alimentarius*. In addition, accreditation of the Thai system has been developed by ACFS based on ISO/IEC 17011 which is the same as the FAO Guidelines with the significant minimum requirements on independence, non-discrimination, impartiality and transparency, accountability and reporting, and others. The certification system has been established by the ADCC of the DOF of Thailand using ISO/IEC Guide 65 as normative basis, especially the important minimum requirements for independence and impartiality, non-discrimination, confidentiality, suspension and withdrawal of certification, and others. The three entities for standard setting, accreditation, and certification are independent from each other thus, avoiding conflict of interest. Although at this stage the certification body has not yet been ISO/IEC 65 accredited by the ACFS but by law the Thai certification body for the Thai National Shrimp GAP can be functional and credible without being accredited. But, it is actually the choice of the ADCC to gain transparency and credibility from the national accreditation body for its professional work in the future.

Thus, this could indicate that the result of the benchmarking of the two schemes has enabled a mutual recognition for the Thai National Shrimp Certification Scheme as conforming to the FAO Aquaculture Certification Guidelines. Nevertheless, more work is needed to improve or revise the text of the Thai National Shrimp Certification Scheme to be in line with the practices as well as streamline with the text and conditions of the FAO Guidelines. In terms of operational work, as the Thai National Shrimp GAP TAS 7401-2009 is relatively new compared with the CoC and GAP shrimp standards, it is important that this new Thai GAP should be well disseminated and introduced through education and awareness building to the shrimp farmers nationwide. Nonetheless, the long experience of the Thai shrimp farmers over the past decade on the implementation of shrimp standard such as the CoC and GAP, it is envisioned that the implementation of the new Thai National GAP would be well perceived and widely accepted for adoption by the Thai shrimp farmers within at most two years.

Recommendations

To date there have been an increasing number of public and private aquaculture standards and/or certification schemes in the global and regional context that respond to the consequent public perceptions and market requirements. However, a credible, transparent and globally acceptable system is very important and crucial to the world aquaculture industry and market.

The benchmarking of the standard and/or certification of the Thai Scheme against the FAO Guidelines can be made by applying or modifying the methodology used as a tool for any benchmarking exercise. Washington and Ababouch (2011) pointed out that a number of private standards and/or private aquaculture certification scheme has proliferated, such as for example the Aquaculture Certification Council (ACC), Global G.A.P., WWF (World Wide Fund for Nature) Aquaculture Dialogues, and Naturland. These private standards/certification schemes have been established and used to serve the international market, mostly the retailers who are primarily located in Europe and the US. It is indicated that various stakeholders at different levels have expressed their concerns about the number and varying quality of schemes, which very often, become the bone of contention of aquaculture producers and processors in producing countries especially those that have already used their own national standards or certification schemes. The requirements of international retailers had actually created a duplication of work for the producers to comply with not only in terms of the national standards but also the various private standards required by the retailers/importers. This has also created confusion as well as high and unnecessary resource wastage. The FAO Aquaculture Certification Guidelines define minimum substantive requirements against which certification scheme or standard can be assessed. It is therefore recommended that an important solution to prove the credibility and equivalence of national aquaculture standards or certification schemes with any private standards/schemes is to benchmark these public and private standards/certification schemes against the FAO Aquaculture Certification Guidelines. This

will help minimize unnecessary duplicated efforts and costs, time and human resource inputs in the aquaculture operation and certification. Most importantly, international retailers should accept equivalent standards taking into consideration their requirements for certified seafood products by private standards. In fact, Walmart as one of the world's largest retailers is a case in point. Recently, the Global Aquaculture Alliance (2011) stated that Robert Fields, a senior director for fresh meat, seafood and gourmet deli at Sam's Club expressed that Walmart and Sam's Club will require their seafood products to come from sources sustainably certified based on Best Aquaculture Practices or equivalent standards. Fields (2011) also pointed out that Walmart defines the equivalence for farmed seafood based on the FAO Guidelines for Aquaculture Certification.

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Incorporating Fisheries Management into Biodiversity Conservation Policies to Enhance Effectiveness of MPAs: A Case Study in Cu Lao Cham MPA, Vietnam

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A Marine Protected Area (MPA) was established in Cu Lao Cham in central Vietnam in 2005 with the main objectives of conserving the marine biodiversity; protecting and effectively exploiting the ecosystems, natural resources, environmental and cultural-historical values for sustainable development; and improving the livelihoods of households in and around Cu Lao Cham Marine Protected Area (CLC MPA). Cu Lao Cham, which is part of the Cham Islands, is located in the South China Sea and administered by the Municipality of Hoi An in Quang Nam Province of central Vietnam.

In order to assess the efficiency and effectiveness of an MPA, it is necessary to understand the extent of involvement and the perceptions of the stakeholders regarding the establishment and management processes of MPAs. A case study was conducted to assess the effectiveness of the Cu Lao Cham MPA. This was done by carrying out face-to-face interviews to ascertain as a social indicator, the perceptions of local communities of the objectives of establishing the CLC MPA, and to subsequently evaluate its effectiveness. In order to verify and confirm the results of the perception survey, the four-year time series data from the area's logbook program was used to determine the trend of catch per unit effort (CPUE) as a biological indicator and net profit derived by households from fishing as an economic indicator. The results of the analysis indicate that there exist some forms of linkages between the ecological, social and economic issues which may give insight into the direct and immediate consequences of MPA management. Furthermore, based on the performance of the ecological, economic and social indicators it could be gleaned that the CLC MPA may be achieving some level of success and may also be one of the few well-managed marine protected areas in Vietnam.

Marine Protected Areas

Marine protected areas (MPAs) can serve as examples of an integrated approach to the management of coastal and marine areas. However, the success of MPAs in terms of management, may be determined if the management objectives are essentially and appropriately defined (Ward and Kelly, 2009). In addition, Claudet *et al.* (2006) cited

that regular monitoring of the operations of an MPA to determine whether objectives are met is essential to evaluate the effectiveness of an MPA. The use of indicators (measurable quantities), reference points (benchmark values), and performance measures for each MPA (Sainsbury and Sumaila, 2003) are necessary to achieve the objectives.

It should be noted that many studies have attempted to measure the biological and ecological influences in local waters within and around an MPA, as shown in the rapidly increasing application of bio-economic models in MPA management (Sumaila and Charles, 2002; Grafton *et al.*, 2005). However, aside from the biological and ecological aspects, an MPA also involves socio-economic and management performance (Himes, 2007). Furthermore, the objectives behind the establishment of MPAs often include ecosystem preservation, fisheries management, and development of recreational non-extractive activities such as "ecotourism" (Alban *et al.*, 2008). Therefore, it is critical



Map of Vietnam showing Cu Lao Cham



to properly take into account the many human dimensions of MPAs in evaluating their effectiveness (David, 2002; Pomeroy *et al.*, 2004).

One of the most crucial aspects of sustainable fisheries management is the need to reduce fishing pressure on coral reefs, which requires intensified implementation and evaluation of incentive-based conservation strategies such as enforcement, conservation rewards, and alternative income programs (Bruner *et al.*, 2001). An MPA could address such concerns as it may provide opportunities for increased employment and improved livelihoods of coastal communities from supplementary activities such as tourism that emanate from the establishment of MPAs (Ward *et al.*, 2001). The effective results from such livelihood opportunities could lead to the development of positive attitudes of local communities towards the establishment of MPAs. A significant linkage between the local people's attitudes and their perceived benefits has been established by Sekhar (2003) and Hans (2003) while McClanahan and Mangi (2000) and Sesabo *et al.* (2006) also showed that positive attitudes and perceptions towards protected areas could enhance compliance and participation in the management by local residents. Additionally, Sanchirico *et al.* (2002) cited that the reaction of fishers towards the management objectives of MPAs will have an influence in the effectiveness of the MPAs. Nevertheless, many marine parks and other similar programs have been promoted to assist small-scale fishers but failed to achieve their social objectives because of inadequate understanding of the complex livelihood strategies and socio-economic conditions of the fishers (Cinner *et al.*, 2010). As a result, efforts to support the fishers through alternative livelihood activities could also bring about negative impacts to the fisheries resources and ecosystem. As exemplified by Walsh and Groves (2009), agricultural subsidy led to increased fishing effort in some households in Kiribati instead of decreasing it as planned. It is therefore necessary to investigate whether alternative income generation

programs implemented in MPAs could create inverse impacts on the MPAs.

Many fishery scientists believed that MPAs could be one of few management tools that could ensure the sustainability of fish stocks and support reef fisheries, considering that the concept of MPAs is founded on the premise that fish population levels recover once fishing activities have stopped (Holland and Brazeel, 1996). McClanahan and Mangi (2000) also indicated that one of the most important roles of MPA is to enhance the local fishery through the "spillover effect" to adjacent protected areas since enhancement could occur through natural dispersal of larvae from the protected spawning grounds (Bohnsack, 1998), and migration of juveniles and adults (McClanahan and Mangi, 2000). Many studies have been conducted on the role of a "spillover effect" of MPAs in enhancing the fisheries surrounding the MPAs. The popular theory of the "spillover effect" indicates that when fishing pressure from specific areas is removed and fisheries in the surrounding waters are regulated, the biomass will build up rapidly, and given the limited space within a marine reserve, fish will eventually 'spill over' into the areas surrounding the reserve, contributing to increased biomass in nearby fishing grounds and boosting fish catch in the fishing zones bordering the no-take zone (Polacheck, 1990; Alcala, 1998), eventually increasing the catch per unit of effort (CPUE) in that zone. A case-study of a marine reserve in the Philippines suggested the existence of a positive effect on catches in adjacent fishing zones (Russ and Alcala, 1996). Another study showed an increase in the CPUE in the St. Lucia Islands in eastern Caribbean, by comparing the CPUE of artisanal fishers before the creation of the reserve and five years later (Roberts *et al.*, 2001).

Enhancement of fisheries could also be understood in the context of the generation of positive economic rent or profits of managed fisheries by the fishers (Guzman, 2004). The results of the study conducted by Guzman (2004) indicated that only a small profit from fisheries was earned in the Baliangao Marine Reserve in southern Philippines. According to Pomeroy *et al.* (2006), the results from implementing an MPA should be considered in terms of increased income, food security and improved infrastructures in local communities. The economic effect from MPAs could also be demonstrated by a combination of increased revenues when switching to more valuable forms of products and the changes in catch composition from smaller to larger fish (Sanchirico *et al.*, 2002).

It is therefore expected that the establishment of MPAs would bring about socio-economic benefits to local communities by sustaining fish stocks. Thus, in order to assess whether MPAs have created a positive impact on the

surrounding coastal fisheries, the use of social, biological, and economic indicators such as the perceptions of local communities on the MPA objectives, as well as on the possible increase in catch-per-unit of effort and net profit of local fishers who fish in areas adjacent to the marine reserves, should be taken into consideration.

The case study of the CLC MPA was intended to answer several relevant practical questions as to whether alternative livelihood activities in MPAs in Vietnam could be addressed by the MPA objectives and what impacts has the CLC MPA had upon the surrounding local communities; what objective should the CLC MPA focus on; and whether the CLC MPA enhanced the fish catch of the surrounding fishing grounds and generated intra-marginal profit. In addition, a question had also been raised as to whether establishing MPAs in Vietnam could be the right approach for the promotion of sustainable fisheries in Vietnam considering that MPAs are supposed provide direct benefits to the ecosystems through their contribution in the restoration of the overfished stocks, abate the risk of fish stock collapse, and provide an alternative to conventional fisheries management tools, which are closely linked to the benefits of ecosystem protection.

The Case Study of Cu Lao Cham MPA

Establishment of MPAs in Vietnam started in 2000 when the Government instructed the former Ministry of Fisheries to develop a master plan for an MPA Network for the whole country. Thus, a list of proposed 15 sites in the whole the country was created, but up to now only four MPAs have been established, these being the Nha Trang Bay MPA, Phu Quoc MPA, Con Co MPA, and Cu Lao Cham MPA. The establishment of the CLC MPA was made possible through decision No 4680/QD-UBND dated 19/12/2005 of the Provincial People's Committee of Quang Nam. The said establishment was also supported by the Danish



Government through its two projects, namely: Support to MPA Network in Vietnam from 2003 to 2006, and Sustainable Livelihoods in and around MPA (LMPA) from 2006 to 2010.

The CLC MPA covers an area of 6710 ha and comprises both protected marine waters and an island nature reserve. The terrestrial area includes 595 ha of protected and 790 ha of rehabilitation forests while the marine component embraces approximately 165 ha of coral reefs and 500 ha of sea grass beds. Coral reefs, sea grass beds, rocky shore, sandy bottom are the important habitats in the waters around Cu Lao Cham Islands, of which, coral reefs and sea grass beds are considered the most productive ecosystems.

The Cu Lao Cham archipelago comprises eight islands but only the main island Hon Lao is inhabited. The population of Cu Lao Cham is about 3000 in 600 households clustered in Hon Lao Island (Hien *et al.*, 2006) and distributed in four villages, namely: Bai Lang, Thon Cam, Bai Ong, and Bai Huong. The inhabitants on Cu Lao Cham are very vulnerable as their only source of income comes from the natural (mostly marine) resources. More than 85% of the households earn their living directly from the marine resources or providing services to marine exploitation activities (McEwin, 2006).

The fisheries in Cu Lao Cham can be characterized as multi-species and multi-gear. Fishing is by far the most important socio-economic activity on Cu Lao Cham, where over two thirds of the households in Bai Lang community and approximately 87% in Bai Huong considered fishing as their main occupation, and in fact approximately 90% of all Cu Lao Cham households earn some of their incomes from fishing (McEwin, 2006). Over half of the fishing households on Cu Lao Cham own boats with engines (McEwin, 2006), which are very small and in general with horsepower capacity ranging from 6 to 20 Hp while only two vessels have 125 and 150 Hp capacity, respectively (Tilde, 2005). The average engine size of the boats is relatively small at 10 Hp (McEwin, 2006).

Different strategies are used by the fishers in Cu Lao Cham, such as operating with different combinations of gears, targeting different species, and going to different fishing grounds throughout the year. Since there are at least 14 main types of gears in the existing 215 fishing boats, many different combinations of gears are possible. Based on the Manual developed by the program on Assessment of the Living Marine Resources in Vietnam (ALMRV) in 1996, specifically on the definition of fleet by construction and fishing strategy, the main fishing fleets in Cu Lao Cham can be grouped into four main fleets, namely: driftnet (120

fishing boats), lift-net (33 fishing boats), long-line (54 fishing boats), and diving (7 fishing boats).

In order to manage the Cu Lao Cham MPA and achieve the objectives, Zoning Plan and Management Regulations were issued through Decision No 88/2005/QD-UBND dated 20/12/2005 by the Provincial People's Committee of Quang Nam. Under this decision, specific zones are regulated as extremely protected zone (core zone), ecological rehabilitation zone, and controlled development zone. Therefore, activities such as those that disturb the environment and ecosystem; create negative impacts on the marine species community, habitat, breeding and growing areas; and the use of dynamite, chemicals, electricity, poisonous chemicals and other destructive activities, are prohibited in the CLC MPA. In support of the biodiversity protection objective, alternative livelihoods have been introduced in the Cu Lao Cham MPA such as environmental quality improvement, tourism development, fish sauce and dried fish production, handicraft production, agriculture development, and public awareness raising activities.

Perceptions of the Local Communities towards the Objectives of MPAs

How the fishers respond to the management objectives of the MPAs will have an influence on the effectiveness of the MPAs (Sanchirico *et al.*, 2002). Alban *et al.* (2008) summarized the general objectives of establishing MPAs as: (i) ecosystem preservation; (ii) fisheries management; and (iii) development of recreational non-extractive activities such as “ecotourism”. Many studies have been conducted on the perceptions of stakeholders towards the objectives of MPAs. In the study conducted by Mangi *et al.* (2008), the perceptions of stakeholders towards the objectives of MPAs in Southern Europe were ranked in accordance with the importance of the objectives of MPAs. In the case of Vietnam, the most common reasons for MPAs establishment were conservation and livelihood improvement, where it had been expected that livelihood improvement would support the conservation objective and reduce the fishing pressure near the MPAs. Therefore, the questionnaire used for this case study was aimed at assessing the perceptions of local people on the importance of the livelihoods improvement objective of the CLC MPA and evaluate its effectiveness. The survey employed the Likert scale techniques (Pomeroy *et al.*, 2004; Shafer and Benzaken, 1998) where the responses on attitudes and perceptions of local people were quantified. The questions included in the survey concerning the objectives of marine protection, had provided the respondents with a list of five specific objectives, whether (1) MPAs protect the marine biodiversity from destructive activities; (2) prevent over-exploitation of marine aquatic species; (3)



improve or sustain yields in adjacent areas; (4) promote the development of tourism; and (5) improve the livelihoods of local communities. The respondents were asked to rank how they perceive the objectives of Cu Lao Cham MPA in terms of importance by using the cardinal number 9 for the most important objective, 8 for second most important, and so on, and 1 for the least important objective. Furthermore, additional questions were asked to look into the perceptions of local people on the values and effectiveness of the Cu Lao Cham MPA.

Semi-structured and key informant interviews were carried out with 90 household respondents of the total 600 households in Cu Lao Cham Islands, to examine the perceptions of the local communities on the establishment of the CLC MPA. The 90 households was the sample size which corresponded to the level of $\alpha = 0.1$ and the acceptable Margin of Error of 0.03 for a continuous data set (Bartlett *et al.*, 2001).

The information collected one year before the establishment of the CLC MPA in 2005 and until the end of 2008, which included the quantity of fish catch using selected fishing gears, starting and ending day of the fishing boats' trips, fishing effort levels, prices of fish, types of target species, variable cost for each trip, and other pertinent data on the CLC MPA, was obtained from the Log Book System of the Cu Lao Cham Islands, and considered as part of the

secondary data for the case study. The Log Book system of Cu Lao Cham Islands was started in 2005 to collect information that include the names of boat owners, capacity of fishing boats in horsepower, fishing gear used, variable costs for each trip, starting day and ending day of the trips, fishing grounds, water depth, species caught, production quantity in kg, and selling price. The logbooks were provided to 80 households of the total 600 households in 2005 and 2006 but this was reduced to 40 households from 2007 up to now. The samples were distributed randomly for fishing fleets which have the same gear and horsepower.

The data in the logbooks were collected monthly and stored in a database. Additional surveys were also carried out from 50 households to gather information on investment costs and fixed costs of categorized fishing fleets in Cu Lao Cham Islands, the economic situation in general and total fishing days, 40 of which had been selected as samples for the Log Book Program and 10 households were selected on a random basis.

After the survey, the perceptions of the local people of the objectives of the Cu Lao Cham MPA were ranked by averages as shown in Fig. 1. The results specifically showed that there was a significant difference in the scoring of the different objectives of MPA (ANOVA: F -value = 27.97, p -value = $9.63E^{-21}$) among all respondents. While the objective on tourism development for establishing an MPA was scored the highest with mean of 7.19 out of 9.00, biodiversity protection was ranked the second most important objective with a mean score of 7.01, while livelihoods improvement was ranked the least important with a mean score of 5.60 out of 9.00. Moreover, in terms of importance the scores given by the local people for over-exploitation prevention and yield improvement were also low with mean scores of 5.80 and 5.50, respectively, although these were higher than the normal score. The result of weighing the importance of the objectives of Cu Lao Cham MPA is surprising, since the objectives of the CLC MPA emphasized on biodiversity conservation and livelihoods improvement. Although the local people ranked biodiversity conservation as a major objective of establishing the MPA, the objective of livelihoods improvement was ranked as the least important. This reality could be due to the fact that community development activities attached to awareness raising programs have been implemented strongly in Cu Lao Cham (Trinh, 2006) participated in by two-thirds of the total residents on Cham Island, especially with regards to education-related activities on MPAs (Completion Report, 2006).

Moreover, almost all local people in Cu Lao Cham are aware of the role of MPAs in terms of biodiversity conservation as reflected in their high level of awareness

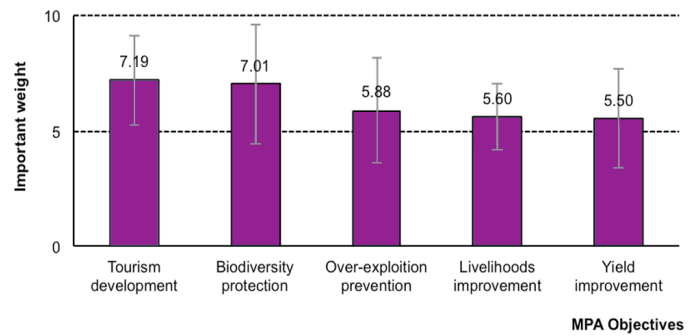


Fig. 1. Comparison of weights given by local people on the objectives of CLC MPA compared with normal score
Source: Perception survey of 90 households

and reaffirmed by about 53% of the respondents who also considered that enforcement and control were the most important factors that could promote the effectiveness of MPAs, while only 20% of the respondents thought that alternative income generation was the main factor that contributed to the effectiveness of MPAs. Consistent with the result of the survey, when the respondents were asked about the success of Cu Lao Cham MPA, only 44% agreed that livelihood improvement was a factor that led to the main success of the CLC MPA while 57% and 27% of the respondents agreed that the establishment of CLC MPA brought about stream of benefits in terms of increased tourism value and fish yield improvement, respectively.

Even with more than 80% fisher respondents who indicated their perceptions of the CLC MPA objectives, the result is contrary to those obtained from research conducted on perception of stakeholders towards objectives and zoning of marine-protected areas in Southern Europe. Fishers in Europe ranked fisheries management including over-exploitation prevention and yield improvement in adjacent areas as the most important objectives of establishing MPAs (Mangi and Austen, 2008).

The variation between the perceptions among the European fishers and those in the CLC MPA could be due to the fact that the approach of MPA establishment in Vietnam focused on biodiversity protection and livelihood improvement while not on fisheries management as in the MPAs in Europe. Nevertheless, although livelihood improvement is one of two objectives in the establishment of the Cu Lao Cham MPA, the result from the survey showed that the perception of local people with regards to the livelihood objective was very low, which suggested that local people on Cu Lao Cham Islands had no idea about the kind of livelihood activities they would like to be involved in, while simultaneously not considering fishing as a sustainable livelihood. This should be a main concern for MPA management in Vietnam as the success of MPA establishment depends on its objectives, and the perception of people towards the objectives of MPA is an important

indicator to measure the success of MPAs. Moreover, as expressed by 27% of the respondents, they will invest in fishing activities only when they can see that it is an alternative livelihood which will create increased income for their families and support livelihood opportunities even if fishing might not bring positive impacts on the improvement of the fisheries resources.

These issues bring back the question as to whether the objective of fisheries management has been overlooked when establishing MPAs in Vietnam since MPAs are supposed to enhance fisheries management in terms of providing direct benefits by contributing to the restoration of overfished stocks (Bohnsack 1996; McClanahan and Mangi, 2000), reducing the risk of fish stock collapse (Fogarty *et al.*, 2000), and providing an alternative to conventional fisheries management tools, which are closely related to the benefits of ecosystem protection. It is widely known that well-managed fishing activities could be a sustainable livelihood, in fact many research studies recognize the role of MPAs and fisheries management in increasing yields in adjacent fishing zones that include enhanced stock recovery and improved financial returns for artisanal fishers from trawl ban introduced in the Gulf of Castellammare in northwest Sicily (Whitmarsh *et al.*, 2002).

Fish Catch and Fishing Effort

Currently in Vietnam, it would be difficult to obtain very detailed fishing effort data, therefore “Boat-Fishing-Days” as effort unit has been used instead because this information could be readily available (ALMRV, 1996). Thus, CPUE was calculated for each fleet in 2005, 2006, 2007 and 2008 using the formula: $CPUE = H_{(ij)} / E_{(ij)}$, where CPUE is catch per unit of effort measured in kg/day, H_{ij} is the total catch by specific gear in the fleet in year i with the sample size j of log-book program, and E_{ij} is the equivalent for fishing effort measured by “Boat-Fishing-Days”.

The annual catch of specific fleet was found by multiplying the mean CPUE of that fleet with total fishing effort which is measured as “fishing-days” in a year and the number of boats of the respective fleets. The annual catch of the fleet is described by the following equation:

$$H = \text{Mean CPUE} * e * n$$

where H is the annual catch in kg of a specific fleet; *Mean CPUE* is the average CPUE of the fleet in a year measured in kg/day, e is the total number of fishing days of the fleet in a year; and n is the total number of fishing boats of such a fleet.

Nevertheless, the present case study did not capture the spillover of individual species nor the whole assemblages from and into the MPA, which are important factors often considered in the planning of reserves. However, the increase in Mean CPUE of long-line and driftnet fleets from 2006 to 2008, specifically the increase in Mean CPUE of long-line from 21.97 kg/day in 2005 (before the CLC MPA was established) to 30.53 kg/day in 2008 (P values for driftnet, lift-net and long-line were 2.66×10^{-40} , 1.89×10^{-08} and 4.3×10^{-13} , respectively) obtained in this study suggested that catch from fish corals may be improving slightly in Cu Lao Cham Islands (Fig. 2).

Such findings could possibly have been the result of an improvement in the fish stocks brought about by increased availability of juveniles and adult fish, and presumably from improved recruitment due to the protection of the broodstock in the MPA. This result concurred with those from some studies on the trend of CPUE in MPAs such as the study conducted by Galal (1999) which showed that increased CPUE at fished sites within Nabq Managed Resource Protected Area, South Sinai, Egyptian Red Sea was observed two years after the establishment of No Take Zone and was statistically significant after five years, suggesting the No Take Zones may be benefiting the fishery through spillover (Ashworth *et al.*, 2005).

The annual fish yield per area in km² of Cu Lao Cham fishing grounds estimated in this study was 16.9 mt/km²/yr. Although there is no data on the annual fish yield per km² in the MPAs in Vietnam, many studies conducted in marine reserves in the Philippines having similar tropical fisheries features as Vietnam, such as Apo Island (central Philippines) for example, one of the first marine reserves in the Philippines, it was reported that the fish yield was from 15 to 30 mt/km²/yr (Alcala, 2001), Sumilon Island (southern Cebu in central eastern Philippines) could

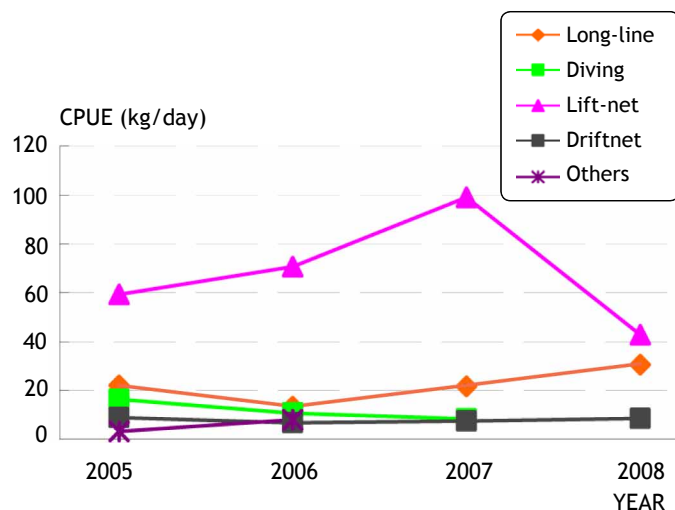


Fig. 2. Mean CPUE of main gear used in fishing fleets in Cu Lao Cham (2005-2008)

Source: Cu Lao Cham logbook data



sustain fish yield between 14 and 37 mt/km²/yr (White and Trinidad, 1998), while the yield values from other marine reserves in the Philippines such as in the Selinog Island (Zamboanga del Norte in southern Philippines), Pamilacan Island (southern Bohol in central Philippines) and San Salvador Island (western Zambales in northwestern Philippines) were reported to be 6.0 mt/km²/yr, 10.7 mt/km²/yr and 14.0 mt/km²/yr, respectively (Guzman, 2004). These figures seemed to indicate that the estimated fish yield by main fleets in Cu Lao Cham is a little higher than the lower limit of Apo Island's and Sumilon Island's fish yields, and much higher than the yields of other marine reserves in the Philippines.

Although no reliable data could be used to examine the change in abundance of the fishery resources around Cu Lao Cham Islands prior to the establishment of the CLC MPA, looking at the conclusion made by Tuan *et al.* (2004) and comparing their findings on fish yields with that of Cu Lao Cham waters, it can be gleaned that the Cu Lao Cham fishing grounds had been heavily over-exploited by local villagers and by 'outside' fishers. Furthermore, the marine resources in the coral reefs were also heavily exploited and as a matter of fact many of the commercially important species have now been declared as rare, endangered and critically endangered as supported by results of the survey conducted by McEwin (2006) which showed that the quantity of fish caught in Cu Lao Cham waters had been declining for several years while some species had completely disappeared. Also, 86% of the fishers reported that there had been a decline in fish catch during the last 5 years with most of them estimating a 30-50% decline.

In addition, the increase in annual CPUE of long-line fleet and driftnet fleet from 2006 to 2008, (Fig. 2) considering no substantial change in technological capacity (it was observed that the oldest fishing boats were built in 1990s and the newest was built in 2005) and comparing the annual fish yield per km² in Cu Lao Cham with other marine reserves in Philippines, seems to reflect that coastal fisheries of Cu Lao Cham could be on a transition path towards becoming a viable and sustainable characteristic of a well-established tropical MPA.

Incomes from Fishing

The annual fishing incomes by major fleets in Cu Lao Cham were estimated by subtracting the total annual variable costs, investment costs and fixed costs from the annual revenues. Fig. 3 suggests that all major fleets had been operating profitably and that some fleets' operations had been more profitable than others'. Vietnamese fisheries has the characteristic of being open-access with no entry limitations, therefore the positive net profits from fishing in Cu Lao Cham from 2005 to 2008 are interesting. The findings could be explained by the fact that first, awareness raising programs for local communities and alternative income generation like tourism development has been implemented well with support from Government of Vietnam and the Danish Government through the project "Support to MPA Network in Vietnam" even before the establishment of Cu Lao Cham MPA in 2005 (Trinh *et al.*, 2006). This may have led to the fact that fishing boat numbers in Cu Lao Cham have not increased during the period 2005 to 2010. Secondly, the positive net profit within fleets in Cu Lao Cham could be explained by the concept of intra-marginal rent in open-access fisheries. This concept comes from the fact that an average vessel, in a group of heterogeneous vessels, could have higher fishing

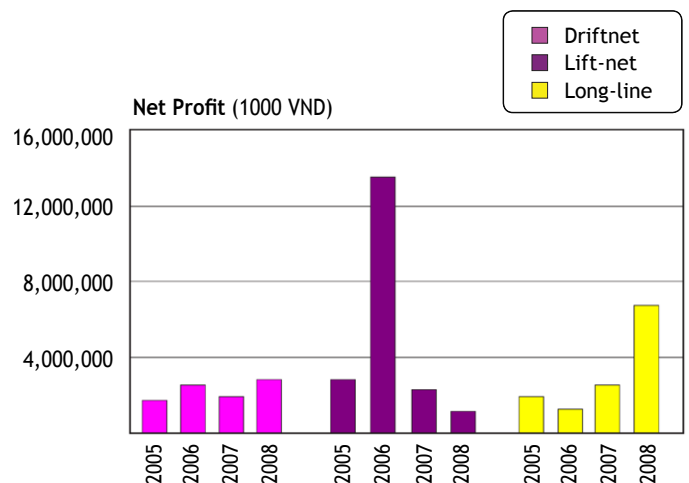


Fig. 3. Net profit of main fishing gears in Cu Lao Cham (2005-2008)

Source: Logbook data and investment and fixed cost survey

efficiency than that of marginal vessels with zero-profit (Long *et al.*, 2008).

Thus, the average net profit of driftnet, lift-net and long-line could be positive without contradicting the theory of open-access fisheries (Copes, 1972). The positive incomes from fishing activities together with the high perception of the local people in Cu Lao Cham on the tourism values that CLC MPA has brought to local community led the local people to believe in the effectiveness of the CLC MPA. This is reflected in the result of the survey which indicated that about 75% of the local people agreed that Cu Lao Cham MPA was effective, although only about 9% of the local respondents thought that the effectiveness of CLC MPA was “very good”, but 66% ranked the effectiveness as “good”. This can be confirmed with the findings of Sekhar (2003) and Hans (2003) that attitudes of local people were significantly related to perceived benefits.

With more than 85 percent of 3000 people living in Cu Lao Cham depending on fishing activities, the rough average monthly incomes from fishing of all gears per person was about VND 165,000 in 2005, VND 565,000 in 2006, VND 217,000 in 2007, and VND 347,000 in 2008. These figures show that the monthly income of fishers in 2005 and 2007 were below the poverty threshold of VND 200,000 and VND 260,000, respectively while the monthly income in 2008 (GSO 2005, 2006, 2007, 2008) was a little bit higher than the poverty threshold of VND 300,000 for rural communities in Vietnam. Although the monthly income in 2006 was more than double the poverty threshold, such income was not sustained over the years. This indicates that although MPAs had been established, the monthly income of people who depend on fisheries was still minimal. This completely matches the low perception of local people of Cham Islands with regards to the objectives of MPAs, especially objectives related to prevention of over-exploitation and fisheries resources improvement.

Discussion and Way Forward

Marine and coastal resources are among the most important renewable natural assets of Vietnam. However, these resources are under increasing pressure from the nation’s rapid development, as the abundance and richness of marine species continue to steadily decline with marine habitats increasingly being degraded or lost. The fallout from these impacts on the marine resources and marine biodiversity are numerous and serious. Fish populations are declining throughout Vietnam’s coastal areas and almost all inshore areas are overexploited, leading to economic hardships for millions of Vietnamese. Indications that marine biodiversity is in decline are widespread. Twenty-five percent of Vietnam’s coral reefs are classified as



being “at very high risk” from degradation and habitat loss—the highest rate of more than 10 countries surveyed in Southeast Asia. Sea grass beds are similarly declining, threatening the livelihoods of the communities that depend on such resources. Mangrove forests, central to the biodiversity of marine and estuarine ecosystems as natural nurseries for a wide range of aquatic species, have declined from 400,000 ha in 1943 to 59,760 ha in 2008. Marine turtle populations have declined dramatically from the cumulative impacts of fisheries by-catch, coastal development and direct harvesting. Looking into the future, there is every likelihood that the pressure on marine and coastal resources will continue, with coastal populations expected to rise (population of Vietnam is expected to grow by tens of millions in the next decades), and with national and provincial plans that continue to put high premium on maximizing production outputs.

Overall, the approach to marine biodiversity conservation interventions in response to such challenges had tended to be opportunistic and independent rather than strategic and coordinated. While generally, progressive and enabling policies and strategies relating to a range of effective conservation and sustainability tools have existed, on the overall these have been underutilized or poorly implemented. For example, while Vietnam has made notable progress in developing marine protected areas

(MPAs) network plan and establishing a few individual MPAs, to date relatively less attention has been paid to their application in biodiversity conservation or sustainable fisheries management. Despite these limitations, the urgency of developing individual MPAs may be driving poorly-informed decisions, with the end result being that Vietnam's MPA network will not meet the optimum levels of biodiversity conservation or long-term economic effectiveness. Similar challenges are being faced in the implementation of relevant national action plans and strategies. While the importance of an ecosystem-based approach has been increasingly recognized in marine and coastal programs and plans as also highlighted in the country's National Biodiversity Strategy, there are very few real examples where such an approach had altered the production-based models that typify planning and management in the marine realm.

The baseline scenario is that continued limited effectiveness, applicability and/or under-utilization of marine spatial management and marine species protection, and lack of mainstreaming of biological conservation and sustainable use in marine fisheries, will only lead to continued degradation of biological diversity and unsustainable use of marine and coastal resources. Therefore, there is a need for the countries in the Southeast Asian region to support the improved understanding of ecosystems through better information collection and management; protecting marine species of special concern through innovative measures that properly consider the incentives and disincentives of the stakeholders influencing their status; optimizing the approach with parallel efforts to implement innovative measures in the production sector to improve fishing practices; accelerating the capacity in monitoring and evaluating key biological and sustainability indicators; and providing reference points for developing and testing strategies for co-management, job diversification and capacity reduction.



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Understanding the Impacts of Extension Methods on the Livelihoods of Small-Scale Fishers

Savitree Rangsihaht and Supaporn Thaipakdee

Information related to the impacts of extension methods on the livelihoods of small-scale fishers were collected from ten participants from seven countries who attended the International Training Course on Coastal Fisheries Management and Extension Methodology organized by the Training Department of the Southeast Asian Fisheries Development Center (SEAFDEC/TD) in Samut Prakan, Thailand on 2-26 November 2010. A questionnaire was designed to collect the data while focus group discussions and in-depth interview were also carried out to gather the relevant qualitative data.

A case study which aimed to recognize the clear evidence of the impact of extension methods on the livelihoods of small-scale fishers was conducted involving 10 fisheries officers from seven countries who attended the SEAFDEC/TD International Training Course on Coastal Fisheries Management and Extension Methodology in November 2010. Specifically, the case study was aimed at elucidating the basic demographic information of the participants and the factors influencing the adoption of extension programs and extension methods, identifying the extension methods chosen by the participants to be fostered to small-scale fishers, and understanding the impacts of extension methods on the livelihoods of small-scale fishers. Out of the ten participants, five had been directly involved with extension programs where they served either as supervisor, coordinator or evaluator of extension programs or member of working committee or Head of Extension Unit. In working with small-scale fishers, the participants chose demonstration and training methods, where they also indicated that cost reduction, less maintenance, expansion of fishing activities, improved fish catch and income were among the major impacts of the extension methods being fostered to the small-scale fishers. Moreover, the participants also recommended that in order to ascertain the impacts of extension methods, investigation of the improvement in infrastructures and environmental changes, should be carried out.

Questionnaires were used to gather the necessary information from the ten participants specifically pertaining to their basic demographic information, and the factors relating to the adoption of particular extension programs and methods. Focus group discussions and in-depth interviews were also conducted to exchange ideas and information between the researchers and the ten target participant-respondents.

Fisheries Extension Methods

The International Training Course on Coastal Fisheries Management and Extension Methodology was organized by SEAFDEC/TD in Samut Prakan, Thailand from 2 to 26 November 2010 in order to assist the fisheries extension officers from the Southeast Asian countries in building up and developing their capacity for integrated coastal management approaches. The training course was also designed to enable the fisheries extension participants to expand their skills beyond the traditional fisheries management concepts. At the course of the training, the participants were also provided with skills in mediation, facilitation, conflict resolution, and appropriate extension methods to mould them into champions and agents of responsible coastal change.

During the said Training Course and specifically on the lecture on “Fisheries Extension: Extension Concept and Method”, ideas were exchanged between the researchers conducting the case study who also served as lecturers of the Training Course, with the ten participants on the impacts of extension methods on the livelihoods of small-scale fishers. The ten participants from seven countries, namely: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, and Thailand, were considered as the respondents of the case study. Two out of the ten participants were females.

Although little evidence was gathered on the effectiveness of particular extension methods but by focusing on demonstration and training, the research-based information gathered through this case study had a clear evidence to



Group of participants during the International Training Course on Coastal Fisheries Management and Extension Methodology

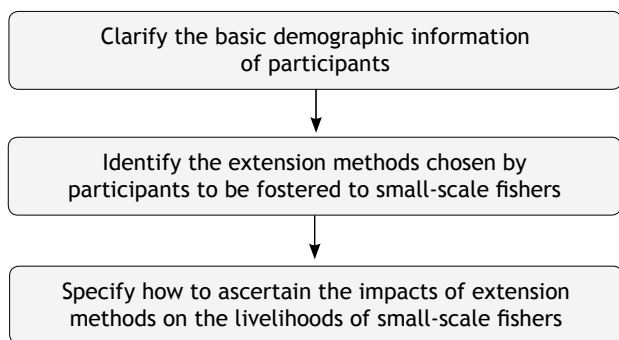


Fig. 1. Steps undertaken during the case study

show the significance of the extension methods. The steps carried out during the case study are shown in Fig. 1. It should be understood that in the case study, **extension methods** refer to individual, group and mass methods of extension, while **impact of extension methods** is concerned with the results of the activities or products generated by the extension methods. **Livelihoods of small-scale fishers** convey the way of living of small-scale fishers, while **extension programs** are the activities organized by extension agents to be introduced to the target audiences.

There are three types of extension methods, namely: individual, group and mass methods of extension. **Individual method** includes home visits, office calls, casual contacts, and personal letters. Home visits could be beneficial since opportunities for discussion on private problems of fishers would be facilitated which otherwise may not occur in other circumstances. Home visits could also give extension agents the opportunity to meet with family members of fishers and learn about family problems. Meanwhile, particular care is necessary in writing letters especially in giving certain advice. In any case, detailed records of all individual contacts should be properly kept including their problems and needs. As an extension agent, it is important that any promises made during the individual acquaintances should be kept and appropriately attended to. Thus, every extension worker should keep a detailed daily diary in which all contacts and promises made are recorded in addition to other relevant activities.

Group method requires more careful planning than the individual method, as this could include meetings, demonstration of methods or results, visit to other villages or fish landings. Group meetings are useful in the developing countries because opportunities for discussion among extension agents, fishers and resource persons in a given locality could be promoted.

Fishers are accustomed to learning by demonstration since this is a way in which fathers teach their sons to fish (TDRI, 2009). Subject matters to be taught could include

net making and hanging, net repair, new methods or variations from old methods of handling, processing and preservation such as salting, smoking, drying and icing fish, and other practical fishing skills. Field visits should be arranged in areas where advanced techniques had been carried out and which have not been used in other areas. Visits are useful since the visitors could have the chance to see the advantages of making certain possible changes.

Mass method of extension would be suitable especially if the objective is to reach out to as many members of the fishing communities as possible. In this regard, such media as radio, television, internet and social network, printed materials such as newspapers, magazines, posters, handouts, should be utilized for the extension services. Nevertheless, since extension work is a form of an out-of-school educational process, it is essential to monitor the changes derived from any extension program in order to assess whether an extension service is proceeding along line with its objectives or not. Therefore, in any extension program, monitoring and evaluation should be included in the planning in order to have a check-and-balance of the progress against the desired objectives of extension programs.

Impact Study

Impact study is referred to as the study of results of any activity or product. In the context of an extension project, impact study focuses on what the project had ultimately achieved and on the wider, positive or negative effects that the project could have on the target audience. Fig. 2 shows the make-up of any project. An impact, which may be intended or unintended, is also referred to as an outcome of any project or activity.

In Fig. 2, **project** refers to a set of tasks or activities being carried out by a target group to address a particular problem. **Vision** is a very general statement of the future status that needs to be improved that the project is envisaged to contribute to. Thus, it can embody the basic motives or reasons for undertaking a project. On the other hand, **goals** are general descriptions of what a project is expected to achieve, while **objectives** are the specific statements about what the project would achieve. **Inputs** are resources used to achieve the objectives, e.g. time, effort, budget, skills, equipments, materials. **Actions** are activities that must be carried out or the strategies that need to be followed for the objectives to be met.

Outputs are activities completed or products made after the implementation of a project while **outcomes** are the results of the activities or products of a project where outcomes are also referred to as **impacts**. **Indicators** are

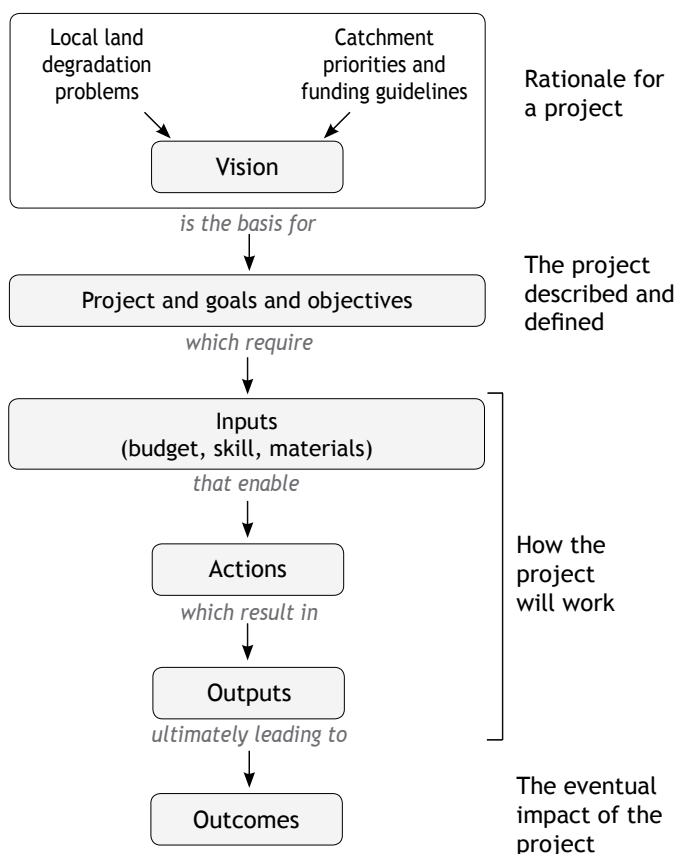


Fig. 2. The make-up of a project
Source: Woodhill, J and L. Robins (1998: 6)

specific characteristics or phenomena that tell about the progress of a project and what impacts have been made on the problem that was set up to be addressed. **Performance indicators** are specific types of indicators that relate to the outcomes to determine whether the project's objectives are met. Therefore, it would require a clear evidence and specific type of indicators to determine the impacts of a project or program.

Related Studies

Rangsihaht, Thaipakdee and Weerawat (2010) studied the impacts of the Regional Fisheries Training Center (RFTC) of the Philippine Bureau of Fisheries and Aquatic Resources (BFAR) on the RFTC Quality Training Service Framework which focused on skills, livelihoods, employment, and food security for fishers. The Framework included hands-on training with practicum on livelihood projects which generated some outputs such as skilled manpower and practicum-livelihood projects. It also generated outcomes or impacts to increase more skilled manpower, food security, job and employment, and reduce poverty. The key implementing strategies of the Framework are summarized in **Box 1**.

Brown (2004) studied the impacts of fisheries extension and training on the livelihoods of the poor in Bangladesh

Box 1. Implementing strategies for the RFTC Quality Training Service Framework of BFAR

- Program cooperation, collaboration, partnership, and resource complementation or counter-parting scheme with BFAR, Regional Fisheries Offices (RFOs), Local Government Units (LGUs), and other concerned agencies including Non-Governmental Organization (NGOs) and People's Organizations (POs).
- Areas of complementation included: (1) LGUs in the areas of food/subsistence, extension services, administration support and livelihood projects; (2) BFAR and RFOs in the areas of livelihood projects and technical support; (3) RFTC in the areas of training management, supplies, handouts, monitoring of hands-on training, practicum-livelihood project, and technical support; (4) Other agencies in the areas of livelihood projects and technical support.

through the Fisheries Training and Extension Project Phase II (FTEP-II) which was funded by the Department of International Development (DFID) and the Department of Fisheries (DoF) of the Government of Bangladesh and was implemented from 1998 to 2003. The goal of the project was to improve fish production of poor fishers/fish farmers in a sustainable way by strengthening the training and extension capacity of the DoF. The extension staff also received training in participatory monitoring and evaluation techniques such as Participatory Rapid Appraisal (PRA), baseline survey and setting of goals. The implementation of the FTEP-II also involved the extension agents, small local NGO extension staff, rural secondary school science teachers, female NGO staff, school training assistants, and teacher training institute staff.

The project used the Sustainable Livelihoods Approach (SLA) Model to study the complexity of poverty and the potentials for poverty alleviation. The results showed that the SLA model was useful to review the impact of the project on the poor and for promoting more holistic collaboration between extension offices at local level and helped ensure that extension programs/projects had better targets, and were demand driven and facilitated the development of pro-poor policies or strategies within the DoF of Bangladesh. The impacts of the FTEP-II on the poor livelihoods are shown in **Box 2**.

Results of the Case Study

Basic demographic information of participants

The average age of the ten participants in the International Training Course on Coastal Fisheries Management and Extension Methodology conducted by SEAFDEC/TD in November 2010 was 36.3 years old. The maximum and minimum ages of the participants were 48 and 29 years, respectively. Six of the participants completed Bachelor's degrees while three obtained vocational certificates and only one received a Master's degree. The participants held different working positions either as lecturer in aquaculture,

Box 2. Impacts of the FTEP-II on the livelihoods of the poor in Bangladesh

1. Increased choice of strategy
2. Fish culture was considered a new strategy for many households
3. Training allowed better decision making on the part of fishers/fish farmers, and integration of aquaculture with other farm resources was a strategy for poverty alleviation
4. Increased income could be attained as well as increased food security and reduced vulnerability of the poor

deputy chief of fisheries administration division, policy and plan officer, fisheries officer, fisheries biologist or fisheries licensing officer, and had been holding such positions for 6.5 years on the average, where the maximum length of experience was 15 years while the minimum was 1 year (Table 1).

Factors relating to the adoption of particular extension programs

From the results of the survey, five participants indicated that they had been directly involved in their respective countries' extension programs. Four participants cited that they had been responsible for the implementation of 1-5 extension programs. However, one respondent has

Table 1. Basic demographic information of participants (N=10)

Basic demographic information of participants	Number	Percent
Age (year)		
≤ 30	3	30.0
31-40	4	40.0
41-50	3	30.0
Ave = 36.3, Min = 29, Max = 48		
Educational attainment		
Vocational certificate	3	30.0
Bachelor's degree	6	60.0
Master's degree	1	10.0
Working position		
Assistant fisheries officer	1	10.0
Deputy Chief of Fisheries Administration Division	1	10.0
Fisheries biologist	1	10.0
Fisheries officer	2	20.0
Fisheries licensing officer	2	20.0
Lecturer in aquaculture	1	10.0
Policy and plan officer	1	10.0
Seed production and data management officer	1	10.0
Working experience (years)		
≤ 5	5	50.0
6-10	3	30.0
11-15	2	20.0
Ave = 6.5, Min = 1, Max = 15		

been responsible for 28 programs. Their assignment was diverse which included either as supervisor, coordinator, facilitator or evaluator of the programs or member of working committee or Head of Extension Unit (Table 2).

Factors relating to implementation of extension methods

Seven participants expressed the need to have experience in the adoption and practice of each method prior to selecting which method to adopt. Six participants, on the other hand, emphasized the need to have knowledge and good understanding of the application of each method. Four respondents, however, stressed on the need to conduct an evaluation of the pros and cons of each method, and having adequate budget to conduct each extension method.

Problems encountered in adopting the extension methods

Taking into consideration the respondents' experience, six indicated that the main problems they often encountered were inadequate budget to implement a particular extension method. Five respondents emphasized the lack of appropriate knowledge to adopt a particular extension method had been their problem. For example in the case of inboard and outboard boat engine repair, and fiberglass boat construction. Three participants expressed that their problems had emanated from inadequate skills in each of the extension method.

Table 2. Factors relating to responsibility in extension programs (N=10)

Factors relating to responsibility in extension programs	Number	Percent
Direct involvement with extension programs		
Yes	5	50.0
No	5	50.0
Number of extension program under responsibility		
None	5	50.0
1-5	4	40.0
6-10	-	-
>10	1	10.0
Ave = 3.9, Min = 0, Max = 28		
Position in relation to extension programs*		
Supervisor	2	20.0
Coordinator	2	20.0
Program's main responsible person	1	10.0
Evaluator	1	10.0
Others		
- Working committee	1	10.0
- Program facilitator	1	10.0
- Head of Extension Unit, Dept of Fisheries Malaysia (Sarawak)	1	10.0

* Note: Multiple responses allowed

Suggestions to better understand and practice extension methods

Nine participants suggested that learning and practicing extension methods should be on-the-job responsibilities. Eight participants emphasized that extension activities should provide knowledge to the target audiences. Six participants also expressed the need to organize field trips to visit areas where the best practices for appropriate extension methods are being advanced. Five respondents put emphasis on the monitoring and evaluation of the pros and cons of each method, and four respondents suggested that workshops on extension methods should also be conducted (Table 3).

Extension methods participants chose to work with small-scale fishers

During the focus group discussions, the participants had the common agreement that before selecting an extension method, extension agents should analyze and understand the geographical location of a particular community that they would be working with. They should also contact both formal and informal leaders to obtain their support and assess their needs. It should also be important to know what a community needs after which such needs are ranked according to the availability of resources, equipment and facilities. The proper extension methods to be adopted should focus on training to promote improvement of the livelihoods of small-scale fishers. There was a case study in Sarawak State of Malaysia where group method of extension was introduced to small-scale fishers through demonstration on the construction of fiberglass boats, and where the benefit of using fiberglass boat compared to a wooden boat was emphasized.

Ascertaining the impact of extension methods on livelihoods of small-scale fishers

The participant-respondents gave clear evidences of extension methods they chose to ensure the impact on the well-being of small-scale fishers (Fig. 3). In the study conducted in Sarawak, the benefits that fishers gained during their participation in the training program on fiberglass boat construction are shown in Box 3. The information received through monthly reports from fishers included period of fishing activities, fuel consumption, total harvest (kg or metric tons) and income from sale of fish catch (in Malaysian Ringgit).

Discussion

Ten participants in the International Training Course on Coastal Fisheries Management and Extension Methodology had varied background. Five have been directly involved with extension programs. The participants agreed that the basic requirements before selecting extension methods

Table 3. Factors relating to an implementation of extension methods (N=10)

Factors relating to an implementation of extension methods	Number	Percent
Basic requirements prior to selecting extension methods*		
Analyzing geographical location, composition and background of target audiences before selecting an extension method	3	30.0
Having enough knowledge in each extension method	6	60.0
Understanding the application of each method	6	60.0
Having experience in the practice of each method	7	70.0
Evaluating the pros and cons of each method	4	40.0
Having enough budget to implement each method	4	40.0
Having enough educational background to adopt an extension program	1	10.0
Problem when adopting the extension methods*		
Not having appropriate knowledge to use a particular extension method such as in inboard and outboard engine repair, fiberglass boat construction	5	50.0
Not having appropriate equipments	2	20.0
Not having appropriate skills	3	30.0
Not having enough budget to implement a particular extension method	6	60.0
Community leaders not strong enough to adopt an extension program	1	10.0
Suggestions to better understand and practice extension methods*		
Providing knowledge on extension methods	8	80.0
Providing workshops on extension methods	4	40.0
Organizing field trips to visit the best practice of appropriate extension methods	6	60.0
Monitoring and evaluation the pros and cons of each method	5	50.0
Learning and practicing extension methods should be on-the-job responsibility	9	90.0

* Note: Multiple responses allowed

should include: having experience in the practice of each method, having enough knowledge in each extension method, and understanding the application of each method. In order to fulfill the implementation of the extension methods, the extension agent should be supported in terms of sufficient budget, knowledge and skills by the concerned agencies. Demonstration and training were selected as appropriate tools in working with small-scale fishers. As illustrated in the results of implementing the training on fiberglass boat construction, some impacts on the livelihoods of small-scale fishers in Sarawak State of

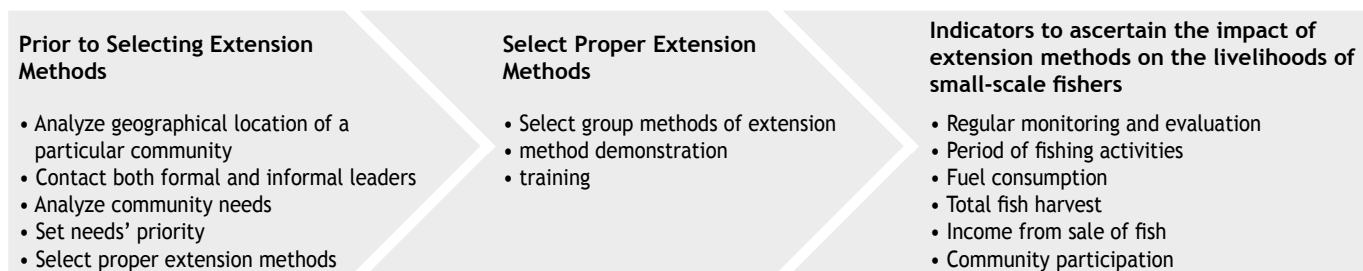


Fig. 3. How to ascertain the impact of extension methods on the livelihoods of small-scale fishers

Malaysia had been established. These findings were as same as the outcomes shown in the study by Rangsihaht *et al.* (2010) and Brown (2004) which suggested that training should be the extension method to be pursued in working with small-scale fishers. The impacts of training on the livelihoods of fishers should include enhanced human capital in terms of confidence building and awareness of rights, social capital such as group belongingness, access to network of fishers and access to credit and NGO's financial capitals in order to gain more profit from fish culture.

Conclusion and Recommendations

Ten participants from seven countries attended the International Training Course on Coastal Fisheries Management and Extension Methodology organized by

Box 3. Benefits gained by fishers from training program on fiberglass boat construction in Sarawak, Malaysia

1. Expand life span of fiberglass boat to 3-4 years whereas life span of wooden boat was 1-2 years
2. Reduce the cost of fuel since the drag force of the fiberglass boat is less than that of a wooden boat
3. Reduce or lower maintenance cost for operating fiberglass boats, especially that costly resin is not used as glue for repairing the boats.
4. Expand the period of fishing activities
5. Improved quality of catch
6. Increased income

Box 4. Recommendations from the case study

1. Extension methods varied from individual to group and mass contacts. To implement each method, one should have experienced in the practice of each method, and should have gained enough knowledge and understanding of the application of each extension method.
2. Learn and practice the extension methods through on-the-job training by providing knowledge, organizing field trips to visit areas where the best practice of appropriate extension methods are carried out, and monitoring and evaluating the pros and cons of each method would be useful to understand and practice the extension methods.
3. To sustain livelihoods of small-scale fishers, improvements in terms of their physical assets such as housing, transportation, sanitation, electricity should be investigated along with the environmental changes such as amount of fish cultured in small canals, drains and ditches before and after the training. This could help to ascertain the impact of training as the extension method adopted on the well-being of small-scale fishers and fish farmers.

SEAFDEC/TD on 2-26 November 2010. Five participants had direct involvement in approximately 3.9 extension programs on the average. They had worked either as program supervisor, coordinator, responsible of program, evaluator, working committee or Head of Extension Unit. The extension methods the participants chose to adopt with small-scale fishers were demonstration and training methods as these had illustrated some impacts on the livelihoods of small-scale fishers in terms of cost reduction, lower maintenance, expansion of fishing activities, increased fish catch and income. Based on the research findings, the recommendations made by the participant-respondents were summarized as shown in **Box 4**.

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CALENDAR OF EVENTS

Date	Venue	Title	Organizer
2011			
15-19 August	Philippines	Training Course on Freshwater Prawn Hatchery and Pond Grow-out Operations	SEAFDEC/AQD
15 Aug-28 Sep	Philippines	Training Course on Parasite Detection and Identification	SEAFDEC/AQD
23 Aug-6 Sep	Philippines	Training Course on Milkfish Farming	SEAFDEC/AQD
6-15 September	Samut Prakan, Thailand	Regional Training Course on Fisheries Management to Combat IUU Fishing for Fishery Managers	SEAFDEC/TD
7-9 September	Songkhla, Thailand	Special Meeting on Improvement of Tuna Information Collection in Southeast Asia	SEAFDEC/TD
14-15 September	Petchaburi, Thailand	Regional Workshop on the Promotion of Inland Small-scale Fisheries Management through Rights-based Fisheries and Co-management Towards Institutional Building and Participatory Approaches	SEAFDEC/TD
15-17 September	Bangkok, Thailand	Special Meeting on Shark Utilization in Southeast Asia	SEAFDEC/TD
20-22 September (Tentative)	(To be determined)	3 rd Meeting on the Gulf of Thailand Sub-region	SEAFDEC Sec.-Sida Project
20-22 September (Tentative)	Kuala Lumpur, Malaysia	Fourth Core Expert Meeting on "Tagging Program for Economically Important Pelagic Fish Species in the South China Sea and Andaman Sea"	SEAFDEC/MFRDMD
26-30 September (Tentative)	Sabah, Malaysia	Training for Scientific Survey on Foraging Habitats of Sea Turtles	SEAFDEC/MFRDMD
26 Sep-01 Oct	Myanmar	International Training Course on Mud Crab Culture	SEAFDEC/AQD
26 Sep-14 Oct	Samut Prakan, Thailand	Regional Training Course on Fisheries Management to Combat IUU Fishing for Fishery officers	SEAFDEC/TD
3-7 October	Samut Prakan, Thailand	Regional Core Expert Meeting on Fishing License, Boat Registration and Port State Measures in Southeast Asia	SEAFDEC/TD
4-6 October	Yangon, Myanmar	Regional WS on Strengthening Assessments of Fisheries and Aquaculture in the Asia-Pacific Region for Policy Development and Management	APFIC
10-14 October	TD	Workshop on Identification of Critical Fishing Grounds and on Regional Habitat Rehabilitation and Management Approach	SEAFDEC/TD
18-20 October (Tentative)	Bangkok, Thailand	Meeting on CITES and Commercially-exploited Aquatic Species	SEAFDEC/TD
October (Tentative)	Singapore	Regional Training Course on Utilization of Freshwater Fish for Value-added Products	SEAFDEC/MFRD
1-2 November	Thailand	Regional Workshop on Promotion of Strategic Implementation of Fisheries Co-management and Right-based Fisheries for Enhancing Good Governance in Coastal and Inland Fisheries Management	SEAFDEC/TD
1-2 November (Tentative)	Kuala Lumpur, Malaysia	Regional Progress Meeting on "Research and Management of Sea Turtles in Foraging Habitats in the Southeast Asian Waters"	SEAFDEC/MFRDMD
8-10 November	Thailand	National Training/Workshop on MCS to Combat IUU Fishing for Sustainable Fisheries Development	SEAFDEC/TD
9-11 November	HCM City, Vietnam	On-site Training Workshop on Traceability Systems for Aquaculture Fish	SEAFDEC/MFRD
14-18 November	Philippines	34 th SEAFDEC Program Committee Meeting and 14 th Meeting of Fisheries Consultative Group of the ASEAN-SEAFDEC Strategic Partnership	SEAFDEC Secretariat
14 Nov-2 Dec	Philippines	Training Course on Freshwater Aquaculture	SEAFDEC/AQD
22 Nov-1 Dec	Philippines	International Training on Community-based Freshwater Aquaculture for Remote Rural Area of Southeast Asia	SEAFDEC/AQD
22 Nov-1 Dec	Thailand	Training Course on Ecosystem Approach to Fisheries in Southeast Asia	SEAFDEC/TD
November (Tentative)	Thailand	Advance Regional Training Program on Cetacean Information Gathering and Research Methodology on Cetacean	SEAFDEC/TD
End of November (Tentative)	Philippines	International Workshop on Fish Health	SEAFDEC/AQD

Southeast Asian Fisheries Development Center (SEAFDEC)

What is SEAFDEC?

SEAFDEC is an autonomous intergovernmental body established as a regional treaty organization in 1967 to promote sustainable fisheries development in Southeast Asia.

Mandate

To develop the fisheries potential of the region by rational utilization of the resources for providing food security and safety to the people and alleviating poverty through transfer of new technologies, research and information dissemination activities

Objectives

- To promote rational and sustainable use of fisheries resources in the region
- To enhance the capability of fisheries sector to address emerging international issues and for greater access to international trade
- To alleviate poverty among the fisheries communities in Southeast Asia
- To enhance the contribution of fisheries to food security and livelihood in the region

SEAFDEC Program Thrust

- Developing and promoting responsible fisheries for poverty alleviation
- Enhancing capacity and competitiveness to facilitate international and intra-regional trade
- Improving management concepts and approaches for sustainable fisheries
- Providing policy and advisory services for planning and executing management of fisheries
- Addressing international fisheries related issues from a regional perspective



TD



MFRD



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AQD



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Fisheries for Food Security - Adaptation to The Changing Environment



The first prize drawing winner from the national drawing contest in Brunei Darussalam.

National Drawing Contests were organized in all ASEAN-SEAFDEC Member Countries as part of the preparatory process for the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment" held by ASEAN and SEAFDEC in June 2011 in Bangkok, Thailand, in order to create awareness on the importance of fisheries for food security and well-being of people in the region.