

Sustainable Development of **Inland Fisheries** in Southeast Asia for Food Security

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As part of the technical preparatory works for the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment” which will be held from 13 to 17 June 2011 in Bangkok, Thailand, SEAFDEC conducted the Regional Technical Consultation (RTC) on Sustainable Fisheries Management in Samut Pakan, Thailand in October 2010. The RTC discussed among other fisheries management matters, the issues relevant to “Sustaining Food Supply from Inland Fisheries”, which is one of the themes for the June 2011 Conference. This article reviews the issues and recommendations raised during the RTC on the said theme, taking into consideration the results of the survey conducted in the ASEAN member countries that aimed to seek the countries’ views and perceptions on the sustainability of the inland fisheries sector especially its contribution to food security.

The Southeast Asian region abounds with freshwater bodies that include rivers, lakes and other wetlands as well as reservoirs where fishes are caught as major source of protein for large part of the region’s populace especially those living in rural areas. Statistics have shown that in 2008, the

region’s population was about 586 million and with food fish requirement of 26.5 kg/capita/year, which means that the region’s demand for fish was about 15.5 million metric tons (Pongsri, 2010). FAO reported that the region’s inland capture fishery production in 2008 was only 2.38 million metric tons or 20% of the world’s total inland capture fisheries production (FAO FishStat Plus 2008). At this level, at least 13% of such requirement could be supplied by the region’s inland fisheries, provided that the region’s potential ecosystems for development are sustainably harnessed.

Considering the fish produced from inland fisheries are very important for local as well as regional consumption and the major threat to the resource is more from infrastructure rather than the fisheries itself, it is important to identify required actions that need to be taken to ensure sustainable production from this fisheries. Although many fishery statistical reports have painted a declining trend of the region’s fish production from inland capture fisheries, such trend does not necessarily indicate an apparent decline of the resources. As shown in **Table 1**, except for Vietnam many countries in the region have shown a slow increasing trend of their inland capture fisheries production. Nevertheless, the

Table 1. Production from inland capture fisheries in Southeast Asia* (in metric tons)

Countries	2004	2005	2006	2007	2008
Brunei Darussalam	0	10	10	0	0
Cambodia	250,000	444,000	559,642	420,000	430,600
Indonesia	330,880	297,370	293,921	310,457	497,740
Lao PDR**	29,800	29,800	29,800	80,597	81,387
Malaysia	4,119	4,583	4,164	4,283	4,353
Myanmar	502,550	631,120	718,000	717,640	814,740
Philippines	142,018	143,806	165,081	168,311	179,491
Thailand	199,600	198,800	214,000	225,600	228,600
Vietnam	146,054**	138,800	152,325	133,600	144,800
TOTAL (SEA)	1,605,021	1,888,289	2,136,943	2,060,488	2,381,711
World’s Total Production** from inland capture fisheries	8,613,912	9,396,013	9,799,740	10,034,692	n/a
% of SEA’s production*** over World’s Total production from inland capture fisheries	18.6	20.1	21.8	20.0	n/a
% of SEA’s production*** over World’s Total production from fisheries and aquaculture	1.1	1.2	1.4	1.3	n/a

* Source: Fishery Statistical Bulletin for the South China Sea Area (2007)

** Source: FAO FishStat Plus 2007

*** Production from inland capture fisheries



in the Mekong River Basin which is considered as one of the most productive water bodies in the world in terms of fisheries. As a matter of fact, Coates (2002) opined that the total fish production in the region appeared to be underestimated by a factor of at least between 2.5 and 3.6, and thus suggested that countries in the region should improve their respective fishery statistical systems and integrate co-management approaches with fishery information generation in order to move towards sustainable management of the region's inland capture fisheries.

The countries in the ASEAN region have always recognized the need to properly manage inland fisheries in order to enhance its contribution to food security in the region. In November 2001 when the SEAFDEC-ASEAN countries developed the Resolution (RES) and Plan of Action (POA) on Sustainable Fisheries for Food Security for the ASEAN Region which was adopted during the 2001 ASEAN-SEAFDEC Millennium Conference "Fish for the People", the countries recognized the "need to emphasize the importance of inland fisheries in planning and policy formulation to improve food security and the livelihoods of rural people" which was clearly stipulated in the RES. Subsequently and along this policy, the POA indicated the necessity of developing national statistical mechanisms on inland fisheries in order to provide bases for the development of the inland fisheries sub-sector.

Prospects for Sustainable Development of Inland Capture Fisheries

In Southeast Asia, the potentials for developing inland fisheries could be high considering the available areas of freshwater ecosystems in each country that have not been fully tapped, especially in the six major inland capture fisheries producing countries (**Table 1**). For example, the Great Lake located in the heart of Cambodia serves as a natural flood reservoir of the Mekong River and supports the country's major inland fisheries. During the flood season, the Lake has a water area of 10,000 km² and 3,000 km²

fish production from inland capture fisheries of Cambodia is something that should be reckoned with due to the abrupt increase in 2006 and with equally abrupt decrease in 2007. In similar manner, Sriputinibondh and Ekmaharaj (2008) suggested that Thailand's increasing trend of production from inland capture fisheries could be a result of the country's efforts in sustainable management of reservoirs and lake fisheries through the adoption of co-management and rights-based reservoir fisheries management, while Myanmar's increasing trend could be due to improved aquatic resources management such as environmental restoration and rehabilitation, restocking of flood plains and improved governance (Coates, 2002).

Looking back at the production from inland capture fisheries (**Table 1**) one would suspect that the data may have been under-reported especially for the countries (*e.g.* Lao PDR)





during the dry season. In the monsoon season, the Great Lake expands to more than 6,000 km² inside the inundated forest creating effective breeding, spawning and nursing areas for various freshwater fishes, as well as serving as fishing ground and contributing to the country's fisheries production of which about 60% is provided by the Tonle Sap Great Lake (Serywuth and Vann, 2009). Indonesia has about 55 million ha (550,000 km²) of open inland waters that include about 1.8 million ha (18,000 km²) of lakes which are the main source of the country's freshwater fish production. There are also more than 50,000 ha (500 km²) of reservoirs although fish production had been constrained by the multi-purpose design of such reservoirs for flood control, irrigation, industry, and domestic purposes (Petr, 1995). Philippines has major freshwater lakes, rivers and other water bodies that include the Laguna de Bay watershed which has an area of 292,000 ha (2,920 km²) but the sustainability of fish production from this lake had been constrained by various factors that include technical, social, environmental, and institutional problems (Israel, 2009). Next to Laguna de Bay is Lake Lanao which is located near Marawi City, Lanao del Sur in central Mindanao, and has a surface area of 340 km². Lake Lanao is used by the

lake communities for small-scale fisheries and recreational activities such as sports fishing, boating and swimming. However, the sustainability of fisheries in Lake Lanao has been threatened by the construction of a number of hydroelectric plants in the Lake that changed the fluctuations of the water level which had affected the indigenous people who depend on lake fisheries for their food and livelihood (Boransing and Sulit, 2009).

While Thailand has freshwater swamps and lakes that cover about 30,000 ha (300 km²), the country has also the largest total area of reservoirs in Southeast Asia which could be more than 300,000 ha (3,000 km²). After the promotion of co-management and rights-based in reservoir fisheries management which was initiated by the Department of Fisheries of Thailand, the lake fishers have been able to earn additional incomes and their livelihood could now be managed sustainably (Sriputinibondh and Ekmaharaj, 2008). Vietnam has vast area of inland freshwater ecosystems comprising more than 1,000,000 ha (10,000 km²) of which about 397,500 ha (3,975 km²) comprise the medium- and large-scale reservoirs with about 550,000 ha (5,500 km²) of paddy fields and 58,000 (580 km²) of small lakes and ponds (Petr, 1995), where freshwater species are produced.

The freshwater fisheries resources of Myanmar have been sustained by the country's extensive river systems such as the Ayeyarwady which is 2,170 km long and traverses the entire length of the country from the north in the border with Mainland China to the south until the Andaman Sea (Mya Than Tun, 2007). Myanmar has more than 21.35 million ha (213,500 km²) of freshwater ecosystems such as natural water (rivers, main stream, lakes), flooded areas, dams/reservoirs and paddy field areas which could be tapped for fisheries development (DOF Myanmar, 2010). The country's inland fisheries consists of freshwater capture and culture-based fisheries which is further divided into leasable fishery,

Box 1. Results from the questionnaire related to safeguarding food security provided by inland fisheries

Factors that threaten food security from inland fisheries

1. Direct alterations to water availability and extent caused by development of other sectors
2. Conversion of catchments for agriculture, forestry, urbanization and other uses causing a range of impacts on the aquatic environment
3. Pollution from industries, agriculture, sewage and other sources affecting fisheries production
4. Lack of management of existing fish stocks and ineffective stocking practices
5. Increasing abundance of predatory or undesirable species including exotics which led to decreasing fishery production
6. Irresponsible fishing by communities using illegal gears and practices

Existing mechanisms (governance and strategies) that enhance food security from inland fisheries

1. Certain fisheries-related activities are taken care of by various sectors, such as water management, pollution control, land-use, stocking, monitoring or controlling diseases, eliminating predatory and undesirable species, among others, although in some cases implementation may not be very effective. However, control of illegal fishing and over-fishing which are being carried out by other sectors seemed to be effective.

reserved fishery and open fishery in which fishing rights are granted under licenses. The Department of Fisheries of Myanmar has been promoting the rehabilitation of inland fisheries resources through stock enhancement by releasing fish seeds into natural lakes, inundated areas, and rivers as well as by conducting culture-based capture methods in leasable fisheries areas.

Sustaining Food Supply from Inland Fisheries

Considering the role of inland fisheries in food security especially in the rural areas, efforts to avert possible decline in fish production from inland ecosystems is deemed fundamental for the sustainable development of this sub-sector. The ASEAN and SEAFDEC which will organize the sequel ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment” in June 2011 in Bangkok, Thailand, have considered “sustaining food supply from inland fisheries”, as one of the themes for the Conference.

As part of the preparatory works for the June 2011 Conference, SEAFDEC convened the Regional Technical Consultation on Sustainable Fisheries Management from 12 to 15 October 2010 in Samut Prakan, Thailand to discuss the issues under such theme, taking into consideration not only the fisheries production aspect but also the prevailing threat from various non-fisheries inland water management schemes. Moreover, the status of the region’s inland fisheries

which could be heavily exploited and suffer greatly from environmental pressures, in particular the deteriorating water quality and habitats, was also considered. Such concerns could be addressed by sharing the responsibility among stakeholders that include fishers, aquaculturists and rice farmers which is particularly important especially in assessing the competition of users for the limited water resource. Co-management systems should also be promoted to empower the communities and stakeholders to participate in the governance of sustainable inland fisheries.

Box 2. Results from the questionnaire related to safeguarding food security provided by inland fisheries

Factors that affect the status of inland fisheries production

1. Structure of fisheries, seasonality of inland fisheries, and fishers livelihood
2. Ecosystem degradation, conservation and management measures, political intervention, and enforcement of regulations
3. Support from government agencies and non-governmental organizations
4. Implementation of MCS, climate change, environmental flow modification, and population pressure and Invasive Alien Species
5. Capacity building, infrastructure and facilities

Ways to enhance production from inland fisheries

1. Adequate and effective MCS
2. Strengthen restocking program
3. Regular meetings of organizations to discuss fisheries related issues, including non-fisheries organizations
4. Good and effective infrastructure and facilities
5. Strengthen cooperation of all concerned in the collection of information as well as in research and management
6. Compliance with global and regional instruments and agreements
7. Integrated approach in the management of water use

Mechanisms for sustainable management of inland fisheries

1. Conservation and management measures
2. Seasonal closures
3. Promotion of fish trade and marketing as well as creation of alternative livelihoods, and access to micro-credits
4. Capacity building and promotion of appropriate technologies and innovations
5. Transparency in decision making on management measures

Strategies to improve sustainable management of inland fisheries

1. Improve management of capture fisheries, and limit access to resources only to those authorized to fish
2. Improve documentation, R&D and knowledge management
3. Establish community funds for inland fisheries development
4. Seasonal closure to protect critical life history of freshwater aquatic species
5. Support the development of sustainable community-based natural resource management
6. Strengthen capacity building and promote appropriate technologies and innovations
7. Promote participatory analyses including participatory in R&D and decision-making by local communities
8. Enhance processing, trade and marketing of fish and fishery products
9. Promote responsible fishing gears, methods and practices

Box 3. Results from the questionnaire related to sustainable co-management in inland fisheries

<p>Status of community-based inland fisheries resources management</p> <ol style="list-style-type: none"> 1. Supportive government policies and legal frameworks 2. Involvement of non-governmental organizations 3. Local community fishers association should be set up 4. Strengthen stakeholders' participation in management
<p>Level of indigenous capacity, knowledge in fishery resources management and willingness of government to share power</p> <ol style="list-style-type: none"> 1. Low level of capacity and knowledge of the communities on management, and low level of the diversity in fishery communities 2. Moderate level of willingness of management authorities to share power 3. Moderate level of willingness of communities to accept management responsibilities
<p>Factors for successful implementation of community-based management/co-management</p> <ol style="list-style-type: none"> 1. Sharing of power between government and communities especially in the area of management 2. Active participation of authorities in community-based management 3. Stakeholders involvement in community-based fisheries management arrangements and in decision making 4. Recognition and addressing the diversity in inland fishery communities 5. Use of property rights approach



Furthermore, since the competition for water and aquatic habitat has been the most critical challenge in inland fisheries management and the inland fish producers will continue to face increasing competition for water from other sources, fishery stakeholders alone cannot address the challenges considering that many problems are generated outside the fisheries sector. Thus, integration, better co-ordination of planning and management of resources shared by fisheries and other users, are required to facilitate sustainable inland fish production. In order to obtain the insights of the ASEAN countries on the issues confronting inland fisheries management, a questionnaire survey was conducted in early 2010, the results of which had been compiled and analyzed in coordination with the SEAFDEC Marine Fishery Resources Development and Management Department (MFRDMD) based in Terengganu, Malaysia, and had been used as basis for discussion of the said theme during the Regional Technical Consultation in October 2010.

Safeguarding Food Security

Inland fisheries in the region are heavily exploited and individual species are often seriously over-exploited, and is aggravated by the prevailing threat from various non-fisheries water management schemes. Thus, sufficient knowledge is required for technical interventions to mitigate the continuing damage by other users and to rehabilitate the impacted inland ecosystems. Five ASEAN countries provided information on two major aspects relevant to safeguarding food security provided by inland fisheries.

Box 4. Results from the questionnaire related to integrating fisheries with multiple inland water resource use

<p>Factors that affect poor involvement of stakeholders in sharing responsibility</p> <ol style="list-style-type: none"> 1. Population pressure 2. Inadequate or absence of Strategic Plan of Action, and absence of legal framework for water management 3. Lack of willingness of communities to be involved in management and accept management responsibilities 4. Poor mechanism to facilitate cooperation and boundaries between adjacent jurisdictions not clearly defined 5. Financial constraints, and absence of coordinating body 6. Political intervention and lack of incentives
<p>Factors that determine the participation and sharing of authority by government and resource users</p> <ol style="list-style-type: none"> 1. Awareness of policy makers in other sectors of the importance of inland fisheries 2. Availability of sufficient budget, appropriate institutional and governance arrangements 3. Adequate manpower and human resources as well as expertise 4. Effective coordination among concerned agencies
<p>Ways for effective management of inland water resource use</p> <ol style="list-style-type: none"> 1. Decisions on water management should consider the impacts on fish and fisheries, and ecosystem services should be optimized 2. Strengthen partnerships and access rights as well as generate synergies and optimize water productivity 3. Effective legislative and policy frameworks should be in place 4. Promote the ecosystem approach to fisheries 5. Provide adequate budget and financial commitments 6. Strengthen manpower and human resources, as well as expertise to manage multiple water use 7. Reduce bureaucracy among agencies sharing the water 8. Promote participatory analyses for direct decision-making on the rehabilitation and management of water resources

These are: (1) factors that threaten food security; and (2) existing mechanisms, governance and strategies to enhance food security from inland fisheries, as shown in **Box 1**.

Sustainable Development of Inland Fisheries

The contribution of inland fisheries to the total world fish production could be minimal compared with marine fisheries but there exist potential areas for development in the region's inland water ecosystems that could lead to increased production. However, the sustainability of fisheries in these areas needs to be examined. Five ASEAN countries provided information on four major aspects relevant to the sustainable development of inland fisheries,

such as (1) factors that affect the status of inland fisheries production; (2) ways to enhance production from inland fisheries; (3) mechanisms for sustainable management of inland fisheries; and (4) strategies to improve sustainable management of inland fisheries. The results are shown in **Box 2**.

Towards Sustainable Co-management in Inland Fisheries

Sharing of responsibilities among stakeholders that include fishers, aquaculturists and rice farmers is particularly important especially in assessing the competition of users for the limited water resource. Co-management systems should

Box 5. Recommendations of the October 2010 RTC on Sustainable Fisheries Management

Safeguarding food security

1. Member Countries should recognize the importance of inland fisheries for food security, and in particular of subsistence fisheries, in sector planning and policy implementation, and where appropriate, subsistence fisheries should be protected and/or receive priority consideration.
2. Member Countries should ensure that the role of inland fisheries in contributing to food security should be enhanced through the development of appropriate strategies, which should be coordinated with respective National Poverty Alleviation Strategies with a view to identifying and/or confirming the extent of their contribution or counteracting the achievements to safeguard food security.
3. The compilation of statistical and information data on inland fisheries should be modified to include also fish consumption survey as well as mobilizing local and indigenous knowledge with the aim of improving the valuation of inland fisheries and monitoring its performance.
4. The impacts of alteration of water ways, conversion of catchment areas for agriculture and other uses, water regulation infrastructures and other infrastructure developments on inland fisheries should be fully recognized, while the Member Countries should make a concerted effort to consult with concerned agencies to maintain the ecological health of water bodies and the connectivity of the habitats.
5. Alternative livelihood should be promoted especially during seasonal flooding/drought considering the migratory and non-homogenous nature of the resources, and that food supply should be safeguarded during off season by developing post-harvest and processing techniques to maintain the food quality and safety of the fish and fisheries products.

Sustainable development of inland fisheries

1. Member Countries should put more emphasis on enhancing awareness of local ecological knowledge, conservation of endangered species, and the impacts of introduction of alien species and aquaculture technology.
2. Fisheries extension of the Member Countries should be reactivated and/or developed to enhance knowledge-based information and management.
3. In order to maintain a healthy ecosystem, Member Countries should regularly assess the adverse impacts of human activities and pollution from land-based activities.
4. Collection, compilation, analysis and dissemination of scientific and statistical data/information should be strengthened to increase the visibility of inland fisheries as one of the important economic sectors.
5. The Member Countries' restocking programs, as the last option, should take into consideration the use of indigenous species and local population in order to maintain the genetic structure of the species in a particular environment, and that introduction of alien species should be avoided.

Towards sustainable community-based/co-management in inland fisheries

1. Member Countries should promote co-management in inland fisheries with appropriate legal framework, community knowledge, institutional linkages, and resources (human and financial).
2. Member Countries should consider developing an enabling environment to provide exclusive fishing rights to communities in co-management.
3. Participation of local communities, fisheries/farmers associations and other stakeholders in inland fisheries management should be enhanced, with the communities taking part in stock assessment by providing data, local ecological knowledge, and status of the stocks.

Integrating fisheries with multiple inland water resource use

1. Inter-agency coordination within the Member Countries should be enhanced to address the issues that are beyond the responsibility of fisheries agencies.
2. Member Countries should ensure that the requirements for multi-disciplinary expertise are served by developing the necessary programs.
3. The existing level of involvement among all stakeholders within the Member Countries in sharing the responsibility of managing inland waters should be assessed with the purpose of improving inputs from fisheries into integrated water resources management.
4. Constraints to the participation and extent of sharing of authority by government and resource users should be identified.

therefore be and where the communities and stakeholders should be empowered to participate in the governance of inland fisheries. Five ASEAN countries provided information on three major aspects relevant to sustainable co-management in inland fisheries, such as (1) status of community-based inland fishery resources management; (2) level of indigenous capacity, knowledge in fishery resources management and willingness of government to share power; and (3) factors for successful implementation of community-based management, as shown in **Box 3**.

Integrating Fisheries with Multiple Inland Water Resource Use

Competition for water and aquatic habitat is the most critical challenge in inland fisheries and for the fishery stakeholders to address such challenges, better co-ordination of planning and management of resources shared by fisheries and other users, would be necessary to enhance sustainable inland fisheries production. Five ASEAN countries provided information on three major aspects relevant to the need to integrate fisheries with multiple inland water resource use, such as (1) factors that affect poor involvement of stakeholders in sharing responsibility; (2) factors that determine the participation and sharing of authority by government and resource users; and (3) ways for effective management of inland water resource use. The results are shown in **Box 4**.

Recommendations of the RTC on Sustainable Fisheries Management (12-15 October 2010, Samut Prakan, Thailand)

Using the outcomes of the survey as basis for the discussion on the theme on **Sustaining Food Supply from Inland Fisheries** during the October 2010 Regional Technical Consultation (RTC), the recommendations from the Member Countries were compiled to be used as inputs in the relevant technical panels of the June 2011 Conference (**Box 5**).

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