

# Harnessing the Potentials of Inland Fishery Resources in Southeast Asia: Role of SEAFDEC/IFRDMD

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Cognizant of the important role that agriculture plays in the economic development of Southeast Asia, especially on the need to increase food production for the increasing population in the region, the April 1966 Ministerial Conference for the Economic Development of Southeast Asia agreed to *develop the region's fisheries as one of the means of improving the food situation of the region*. The same Conference also sought the cooperation of Japan for the establishment of a Marine Fisheries Research and Development Center in Southeast Asia. The ensuing December 1966 Conference on Agriculture Development in Southeast Asia conformed to the prior understanding that *fisheries development should be promoted in the region* to improve nutritional standards and increase supply of animal protein, and evoked that such goal could be achieved through *research, development and expansion of fisheries techniques appropriate for the region*. While also considering that inland water fisheries is important for several countries in the region, the December 1966 Conference also agreed to *consider the need for multiplication and conservation of inland water fishery resources*. Thus, in order to jump-start the establishment of the proposed Center, a study working group consisting of fisheries experts from Southeast Asia and Japan was put together in early 1967 to assess the requirements and procedures for such undertaking. The study group's recommendations to establish the **Southeast Asian Fisheries Development Center** including the draft Agreement for establishing the proposed Center, was then considered and adopted during the Second Ministerial Conference for the Economic Development of Southeast Asia convened in the Philippines in April 1967. Also included in the adopted recommendations of the study group was the organization structure of the proposed Center which shall initially consist of the Marine Fisheries Training Department (later known as the Training Department or TD) and Marine Fisheries Research Department (MFRD), with the respective working programs of such Departments. After the draft Agreement had been finalized through the initiative of Japan, Malaysia, Philippines, Singapore, Viet Nam, and Thailand, signing of the Agreement was arranged on **28 December 1967 in Bangkok, Thailand** and the Inaugural Meeting of the SEAFDEC Council was convened in Thailand in March 1968, in accordance with the said Agreement establishing SEAFDEC.

One year later, the common interest of the Southeast Asian countries to improve the current fish culture technologies in order to contribute to the overall objective of increasing food production was expressed by the governments during the subsequent Third Ministerial Conference for the Economic Development of Southeast Asia in 1968. SEAFDEC was then asked to consider the establishment of a third Department to deal with freshwater and brackishwater fish culture. The study group composed of aquaculture experts from the Member Countries which was formed for this purpose, came up with a proposal which was adopted by the Fourth Ministerial Conference for the Economic Development of Southeast Asia in 1969 giving impetus to the establishment of the Aquaculture Department (AQD) in the Philippines which was agreed upon by the SEAFDEC Council during its Meeting in Malaysia in July 1973. Two decades after the Inaugural Meeting of the SEAFDEC Council, the Government of Malaysia proposed during the 21<sup>st</sup> Meeting of the Council in 1988, the establishment of a SEAFDEC Department for fishery resource development and management to be hosted by Malaysia, considering the declining state of the region's fishery resources and the need to match exploitation level with resource ability and regeneration. The SEAFDEC Council adopted the recommendations of the Technical Working Group that reviewed the proposal, and agreed during its 24<sup>th</sup> Meeting in 1991 to establish the Marine Fishery Resources Development and Management Department (MFRDMD) in Terengganu, Malaysia. In view of some technical issues including the finalization of its working programs, MFRDMD was officially established in 1992.

Meanwhile, as inland fisheries received more attention considering its potentials to supply fish required for the growing food needs of the populace, especially the region's rural poor, the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security in the New Millennium "Fish for the People" in November 2001 included in one of the agenda, discussion on Inland Fisheries Development and Management. It was also recognized during the Conference that there is a need to compile real time data and information for the proper valuation of inland fisheries that could be used during planning and management of the inland fisheries sub-sector. Moreover, the Conference also considered it important to establish an approach that would recognize the role of inland fisheries within a multiple use water management system and foster restoration of critical habitats including fish migratory routes. As a result, the Resolution and Plan of Action adopted during the 2001 Conference included the need for the ASEAN countries to promote the importance of inland fisheries and aquaculture in planning and policy formulation, as means of improving food security and livelihoods of the rural people. Moreover, the subsequent Resolution which was adopted during the succeeding ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment" in June 2011, specified that the ASEAN countries should enhance the awareness of stakeholders on the contribution of inland fisheries to food security and sustainable livelihoods, and that all concerned stakeholders should be involved in undertaking development projects that may impact the inland fisheries. As a response to the aforementioned pronouncements, SEAFDEC has sustained its efforts in promoting inland aquaculture through AQD, and inland fisheries development through the newly-established SEAFDEC Inland Fishery Development and Management Department (IFRDMD) in Palembang, Indonesia for the sustainable development and management of inland fisheries in Southeast Asia.

## Inland Fishery Resources of Southeast Asia with Potentials for Fisheries Development

The Southeast Asian region is endowed with enormous areas of natural inland water resources that could be tapped for sustainable development of freshwater fisheries as well as man-made water bodies that could provide additional resources. Although not comprehensive enough, **Table 1** partly shows the available natural and man-made water bodies in Southeast Asia, comprising river systems, lakes, floodplains, reservoirs and dams, wetlands, and others. It is against the backdrop of such valuable gift provided by nature and in some cases enhanced by humans, with huge potentials for development but mostly remained under-utilized, that the Minister for Marine Affairs and Fisheries of Indonesia in 2011 (SEAFDEC, 2011a) offered to host a regional center for inland fisheries development as part of the SEAFDEC organization. Recognizing that inland fisheries could complement to a great extent fish production from marine capture fisheries and aquaculture, the ASEAN countries during the 2011 ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food

Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment”, concurred to the proposed establishment of such inland fisheries center in Indonesia.

Based on such an agreement, the Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 which was adopted by the Ministers responsible for fisheries of the ASEAN-SEAFDEC Member Countries during the same ASEAN-SEAFDEC Conference, clearly included provisions for the sustainable development of inland fisheries in Southeast Asia (**Box 1**). This same argument had also fuelled the decision of the Minister for Marine Affairs and Fisheries of Indonesia to push through with the proposed establishment of a regional center for inland fisheries development under the SEAFDEC umbrella organization. Thus, the eventual establishment of the SEAFDEC Inland Fishery Resources Development and Management Department in Palembang, Indonesia came into force on 2 September 2014 upon subsequent consideration and endorsement by the Council of Directors of the Southeast Asian Fisheries Development Center.

**Table 1.** Natural as well as man-made water bodies in Southeast Asia

Country	Rivers (km <sup>2</sup> )	Lakes (ha)	Floodplains <sup>1</sup> (ha)	Reservoirs (ha)	Dams (ha)	Wetlands <sup>2</sup> (ha)	Others (ha)
Cambodia <sup>3</sup>	1,482.82 <sup>a</sup>	334,186.79 <sup>b</sup>	727,382.10 <sup>b</sup>	11,684.47 <sup>b</sup>	7,805.00 <sup>c</sup>	2,412,401.00 <sup>b</sup>	254,796.55 <sup>b,d</sup>
Indonesia <sup>4</sup>	1,899,750.00 <sup>e</sup>	1,800,000.00 <sup>f</sup>	33,281,155.00 <sup>g</sup>	500,000.00 <sup>h</sup>	26,522,193.00 <sup>h</sup>	20,096,800.00 <sup>i</sup>	3,852,223.09 <sup>i</sup>
Lao PDR <sup>5</sup>	123,347.80	-	156,000.00	130,309.78	-	843.60	-
Malaysia <sup>6</sup>	312,840.67 <sup>k</sup>	109,489.00 <sup>l</sup>	2,979,918.00 <sup>m</sup>	included in lakes		6,942,556.00 <sup>n</sup>	-
Myanmar <sup>7,o</sup>	737,800.00 <sup>p</sup>	-	6,000,000.00 <sup>p</sup>	1,800,000.00 <sup>p</sup>	-	-	1,300,000.00 <sup>p</sup>
Philippines <sup>8</sup>	108,923.00 <sup>q</sup>	187,168.40 <sup>q</sup>	-	19,000.00 <sup>r</sup>	-	246,063.00 <sup>r</sup>	253,854.00 <sup>s</sup>
Thailand <sup>9</sup>	511,311.00 <sup>t</sup>	-	12,851,984.00 <sup>u</sup>	645,350.62 <sup>v</sup>	-	-	965,739.37 <sup>w</sup>

<sup>1</sup> Floodplains are areas of low-lying grounds adjacent to a river, formed mainly of river sediments and subject to flooding

<sup>2</sup> Wetlands are areas saturated with water, either permanently or seasonally, take on the characteristics of distinct ecosystem (e.g. swamps, marshes, bogs) and vary widely in terms of soil composition, topography, hydrology, water chemistry, vegetation, among others

<sup>3</sup> General Source: Chin Leakhena (pers comm., 2015)

<sup>a</sup> Source: River network (JICA, 2002)

<sup>b</sup> Source: Land use (JICA, 2002)

<sup>c</sup> Source: Open Development of Cambodia (ODC, 2014)

<sup>d</sup> Refer to the Tonle Sap

<sup>4</sup> General Source: Sevi Sawestri (pers comm., 2015)

<sup>e</sup> Daftar Wilayah Sungai Kementerian PU RI/Ministry of Public Works: [http://sda.pu.go.id:8181/sda/index.php?act=daftar\\_ws](http://sda.pu.go.id:8181/sda/index.php?act=daftar_ws)

<sup>f</sup> Kelautan dan Perikanan Dalam Angka/Marine and Fisheries in Figures 2014, Page 42 & 165; Kartamihardja (2015)

<sup>g</sup> Buku Informasi Statistik Pekerjaan Umum 2013, Page III-21; 10,802,132.00 ha have potentials for agriculture, 22,479,023.00 not suitable for agriculture

<sup>h</sup> Buku Informasi Statistik Pekerjaan Umum 2013, Page III-10 & 12; Kartamihardja (2015)

<sup>i</sup> Wetlands include peat swamps (Kartamihardja, 2015); Others include mangroves

<sup>5</sup> General Source: Phongsavanh Sengsomphou: Other sources: <https://en.wikipedia.org/wiki/Mekong>; <https://lo.wikipedia.org/wiki/ແມ່ນ້ຳຂອງ>; [https://en.wikipedia.org/wiki/Nam\\_Theun\\_2\\_Dam](https://en.wikipedia.org/wiki/Nam_Theun_2_Dam); [www.internationalrivers.org/.../study\\_prepared\\_by\\_fisheries](http://www.internationalrivers.org/.../study_prepared_by_fisheries); [www.seafdec.or.th/.../627-report-on-the-preliminary-survey](http://www.seafdec.or.th/.../627-report-on-the-preliminary-survey); [www.poweringprogress.org/new/9.../17-se-xet-2-76mw](http://www.poweringprogress.org/new/9.../17-se-xet-2-76mw); [https://en.wikipedia.org/wiki/Nam\\_Ngum\\_Dams](https://en.wikipedia.org/wiki/Nam_Ngum_Dams); [www.houaykaphou.com](http://www.houaykaphou.com); [www.internationalrivers.org/campaigns/nam-ou-river](http://www.internationalrivers.org/campaigns/nam-ou-river); [https://en.wikipedia.org/wiki/Nam\\_Ngum](https://en.wikipedia.org/wiki/Nam_Ngum); [www.mrcmekong.org/.../TB-Lao-Thai-Xe-Bang-Hieng-Na](http://www.mrcmekong.org/.../TB-Lao-Thai-Xe-Bang-Hieng-Na); [www.icem.com.au/.../wetlands%20wshop/g.Lao\\_wetland\\_s](http://www.icem.com.au/.../wetlands%20wshop/g.Lao_wetland_s)

<sup>6</sup> General Source: Hemalatha Raja Sekaran (pers comm., 2015)

<sup>k</sup> Source: [http://forum.mygeoportal.gov.my/smanre/sungai/lembangan\\_sungai\\_utama\\_kategori.php](http://forum.mygeoportal.gov.my/smanre/sungai/lembangan_sungai_utama_kategori.php)

<sup>l</sup> No comprehensive inventory of lake resources in Malaysia but preliminary assessment indicates more than 90 lakes (lakes+reservoirs) with total area of at least 100 000 ha; Source: <http://asmic.akademisains.gov.my/download/water/Vol.1%20Main%20Report%202009.pdf>

<sup>m</sup> Source: [http://forum.mygeoportal.gov.my/smanre/sungai/kaw\\_banjir\\_msa.php](http://forum.mygeoportal.gov.my/smanre/sungai/kaw_banjir_msa.php)

<sup>n</sup> Include natural and constructed wetlands ([http://www.wetlands.org/Portals/0/publications/Report/WI\\_GRoWI-Asia\\_1999.pdf](http://www.wetlands.org/Portals/0/publications/Report/WI_GRoWI-Asia_1999.pdf))

<sup>7</sup> General Source: Than Than Lwin (pers comm., 2015); FAO and NACA (2003)

<sup>o</sup> The total inland water bodies of Myanmar could comprise about 8.2 million ha of which about 1.3 million are permanent while the remaining are seasonally inundated floodplains

<sup>p</sup> Source: FAO and NACA (2003)

<sup>8</sup> General Source: Marylene M. Mandreza (pers comm., 2015)

<sup>q</sup> Philippine Rivers, Lakes, Coastal, and Marine Waters @ website: <http://jcregsolutions.weebly.com/blogs/philippine-rivers-lakes-coastal-and-marine-waters>

<sup>r</sup> Philippine Fisheries Profile @ website <http://www.bfar.da.gov.ph/profile> (wetlands include freshwater wetlands – 106,328 ha; brackishwater wetlands – 239,323 ha)

<sup>s</sup> Others include fishponds (freshwater – 14,531 ha; brackishwater – 239,323 ha)

<sup>9</sup> General Source: Chutima Pokhun (pers comm., 2015)

<sup>t</sup> Source: <http://www.haii.or.th/wiki/index.php/>

<sup>u</sup> Source: <http://www.prevent.80rider.com/index.php/2014-11-13-16-14-04/2014-11-13-16-19-52>

<sup>v</sup> Source: [http://group4-51.blogspot.com/2008/09/blog-post\\_12.html](http://group4-51.blogspot.com/2008/09/blog-post_12.html)

<sup>w</sup> Others include fishponds (<http://www.mkh.in.th/index.php/2010-03-22-18-05-14/2010-03-26-05-51-54> (brackishwater – 320,388.75); Source: [www.inlandfisheries.go.th/images/active/academic/GAP11-1.ppt](http://www.inlandfisheries.go.th/images/active/academic/GAP11-1.ppt) (freshwater – 645,350.62))

**Box 1. Provisions on Inland Fisheries Management in the Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 (SEAFDEC, 2011b)**

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/floodplains 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 waterways
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/floodplain 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

## Production from Inland Fisheries in Southeast Asia

Inland fisheries, for the purpose of this article, comprise inland capture fisheries and freshwater aquaculture, which had been providing many countries of Southeast Asia with food fish that supply the nutritional requirements of the populace ensuring food security, especially in the rural areas. During the period from 2008 to 2013, the region's inland fisheries attained an average growth rate of 5.0% in terms of volume and about 6.0% in terms of value (Table 2, Fig. 1, Fig. 2). Specifically, production from inland fisheries in 2013 contributed about

25% to the total fisheries production of Southeast Asia (Fig. 3), indicating its valuable contribution to the region's food stability.

It could be gleaned from Table 1 that Indonesia has more than 256 million ha of inland water bodies, followed by Myanmar with more than 82 million ha, Thailand with more than 66 million ha, and Philippines with more than 12 million ha. Although Cambodia seems to have only more than 4 million ha of inland water bodies, the Tonle Sap Great Lake could expand from 250,000 ha to more than 1.6 million ha during the wet season creating huge areas of wetlands that occupy about 30% of the country's total land area (Try and Sitha, 2011), providing vast areas of natural habitats for freshwater aquatic species. The information in Table 1 however, is not comprehensive enough since Viet Nam could not provide the total area of its inland water bodies.

Correspondingly in 2013 (Table 3), Indonesia produced high volume of inland aquatic species comprising mainly

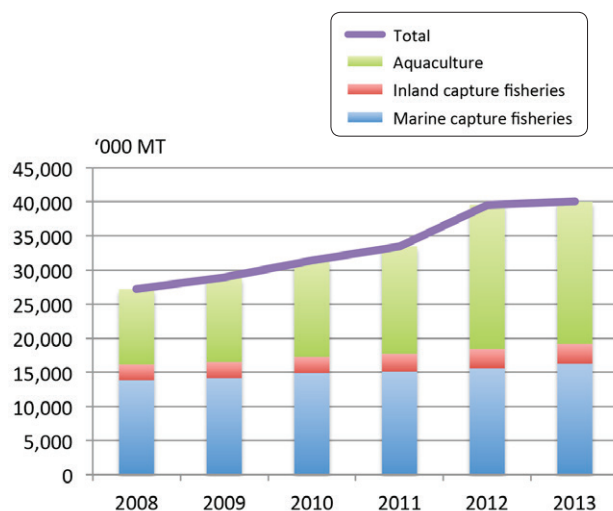


Fig. 1. Total fisheries production of Southeast Asia (2008-2013)

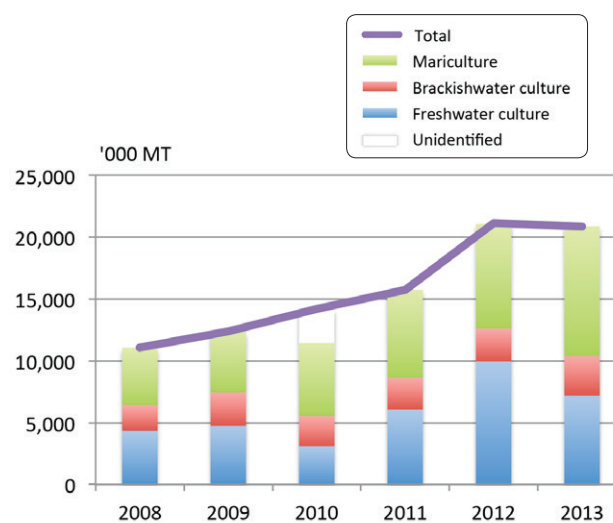


Fig. 2. Production from aquaculture of Southeast Asia (2008-2013)

**Table 2. Fisheries production 2008-2013: World vs. Southeast Asia**

	2008	2009	2010	2011	2012	2013
<b>Total fisheries production*: World ('000 MT)</b>	143,100	145,800	148,100	155,700	157,900	162,800
<i>Marine capture fisheries ('000 MT)</i>	79,900	76,600	77,800	82,600	79,700	80,900
<i>Inland capture fisheries ('000 MT)</i>	10,300	10,500	11,300	11,100	11,600	11,700
<i>Aquaculture ('000 MT)</i>	52,900	55,700	59,000	62,000	66,600	70,200
<b>Total fisheries production**: Southeast Asia</b>						
- Volume ('000 metric tons (MT))	27,207.8	28,917.1	31,438.4	33,487.7	39,567.2	40,040.9
- Value ('000 000 US\$)	28,585.8	29,215.3	38,744.2	43,782.9	44,958.9	41,845.8
<b>Marine capture fisheries</b>						
- Volume ('000 MT)	13,814.4	14,140.4	14,874.5	15,095.5	15,590.7	16,256.8
- Value ('000 000 US\$)	12,338.2	10,416.7	15,898.8	21,178.8	20,049.0	20,349.5
<b>Inland capture fisheries</b>						
- Volume ('000 MT)	2,329.5	2,397.3	2,377.3	2,646.1	2,820.0	2,884.5
- Value ('000 000 US\$)	2,215.4	2,834.5	2,526.5	2,914.4	3,226.6	3,279.7
<b>Aquaculture***</b>						
- Volume ('000 MT)	11,063.9	12,379.5	14,186.7	15,751.2	21,160.5	20,889.6
- Value ('000 000 US\$)	14,032.2	15,964.2	13,377.7	19,689.7	21,683.3	18,216.6
<b>Freshwater culture</b>						
- Volume ('000 MT)	4,345.8	4,739.9	3,098.0	6,071.3	9,961.0	7,198.5
- Value ('000 000 US\$)	4,716.2	6,583.4	4,186.5	5,486.5	6,322.8	7,404.6
<b>Brackishwater culture</b>						
- Volume ('000 MT)	2,072.0	2,694.3	2,435.2	2,557.2	2,638.4	3,191.9
- Value ('000 000 US\$)	3,471.5	7,156.1	6,468.6	6,137.7	6,047.9	8,218.8
<b>Mariculture</b>						
- Volume ('000 MT)	4,646.1	4,945.2	5,886.6	7,122.7	8,467.1	10,509.2
- Value ('000 000 US\$)	2,994.5	2,224.7	2,722.6	1,784.5	2,929.6	2,593.2
<b>Production from inland fisheries****: Southeast Asia</b>						
- Volume ('000 metric tons (MT))	6,675.3	7,137.2	5,475.3	8,717.4	12,781.0	10,083.0
- Value ('000 000 US\$)	6,931.6	9,417.9	6,713.0	8,400.9	9,549.5	10,684.3

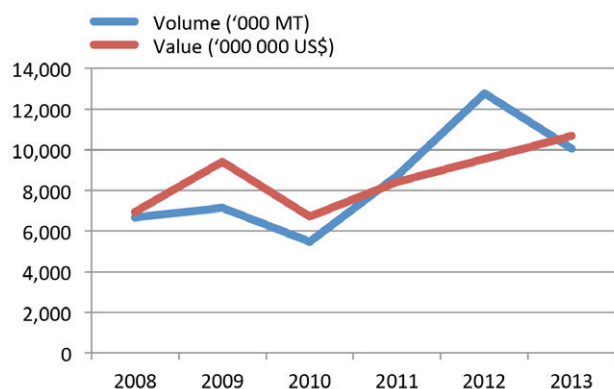
\* Source: FAO (2014)

\*\* Source: SEAFDEC (2014)

\*\*\* Sources: SEAFDEC (2010); SEAFDEC (2011c); SEAFDEC (2012); SEAFDEC (2013); SEAFDEC (2014)

\*\*\*\* Note: inland fisheries comprise inland capture fisheries and freshwater aquaculture

miscellaneous freshwater fishes followed by striped snakehead, Nile tilapia, and snakeskin gourami from inland capture fisheries, and Nile tilapia, torpedo-shaped catfishes, and *Cyprinus carpio* from freshwater aquaculture. The country's



**Fig. 3. Total production from inland fisheries of Southeast Asia (2008-2013)**

production from inland fisheries contributed about 15% to the country's total fisheries production in 2013 in terms of volume and about 25% in terms of value. For Myanmar, its high production from inland capture fisheries comprised mainly miscellaneous freshwater fishes and roho labeo from freshwater aquaculture, and accounted for 47% of the country's total fisheries production in 2013 in terms of volume and 44% in terms of value. Production from inland capture fisheries of Thailand comprised mainly miscellaneous freshwater fishes, and Nile tilapia and giant freshwater prawn from freshwater aquaculture. For Viet Nam, its main production from freshwater aquaculture comprised mainly miscellaneous freshwater fishes. Production from inland capture fisheries of the Philippines comprised mainly freshwater mollusc and tilapia, while Nile tilapia and miscellaneous freshwater fishes were produced from freshwater aquaculture. This information suggests the high diversity of the region's freshwater aquatic resources.



**Table 3.** Total production of Southeast Asia from inland fisheries (as of 2013)

Production from:	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Thailand	Viet Nam
<b>Inland capture fisheries</b>								
Volume ('000 MT)	528.0	391.3	40.1	5.6	1,303.0	194.6	213.7	208.1
Value ('000 000 US\$)	-	741.8	-	20.1	1,954.5	206.6	356.8	-
<b>Freshwater aquaculture</b>								
Volume ('000 MT)	85.3	2,412.0	124.1	132.9	922.3	276.6	490.0	2,754.4
Value ('000 000 US\$)	-	4,303.5	-	279.5	1,434.4	448.2	935.8	-
<b>Total for inland fisheries</b>								
Volume ('000 MT)	<b>613.3</b>	<b>2,803.3</b>	<b>164.2</b>	<b>138.5</b>	<b>2,225.3</b>	<b>471.2</b>	<b>703.7</b>	<b>2,962.5</b>
Value ('000 000 US\$)	-	<b>5,045.3</b>	-	<b>299.6</b>	<b>3,388.9</b>	<b>654.8</b>	<b>1,292.6</b>	-

\*Values of production from three countries (Cambodia, Lao PDR, Viet Nam) not available  
Source: SEAFDEC (2015), in press

## Role of SEAFDEC/IFRDMD in the Sustainable Development and Management of Inland Fisheries in Southeast Asia

As indicated in **Table 1**, the Southeast Asian region embraces very rich and most diverse inland water bodies such as river systems, lakes and others, in terms of aquatic resources and biodiversity. SEAFDEC/IFRDMD aims to harness the potentials of such water bodies through its R&D programs and activities, notwithstanding many reports demonstrating that such resources have been slowly degrading due to overexploitation and other factors both internal and external. IFRDMD considers it urgent to promote the sustainable development and management of such resources in order that their functions in ensuring food security and alleviating poverty in rural areas could be assured. One of the main challenges in sustaining the functions and services of inland water resources is the high competition for water resource utilization especially in major river systems, e.g. the Mekong River. Construction of hydropower and irrigation systems associated with economic development could compete for water resource utilization negatively affecting the aquatic resources, but such efforts could not be prevented for the sake of progress. It is therefore necessary that the development of inland fisheries be advocated by emphasizing the value of inland fisheries production through better data and information compilation.

A good compilation of data and information on inland fisheries would help policy makers and people from other sectors understand the contribution of inland fisheries to food security, thus, facilitating cross-sectoral coordination and high-level policy interventions to secure the sustainability of inland water resources. Construction of cross-river infrastructures could also create barriers to water flow resulting in disconnectivity of aquatic habitats and obstructs the natural “flood pulse” necessary for fish reproduction and larval dispersion. Alternative means could still be done to protect the biodiversity of aquatic species and sustain fisheries production through such mitigating measures as construction of fish pass or fish

ways that could reconnect the habitats and facilitate upstream-downstream or horizontal migration of fish.

The inland fisheries sector should therefore develop fish pass models that are suitable to support migration of aquatic species, and ensure that such models are brought up to the attention of policy makers to ensure the sustainability of inland fisheries (Pongsri, 2015). Moreover, construction of cross-water obstacles could create drastic swing of the water levels resulting in water fluctuations which could lead to disorientation on the part of aquatic organisms, threatening their spawning behavior and their ability to survive in such environment. Measures to mitigate these impacts should therefore be developed and promoted. Furthermore, inland capture fisheries and related activities are highly seasonal with peaks during the wet season, when huge volumes of fish could be harvested. Such large

### Box 2. Functions of SEAFDEC/IFRDMD

IFRDMD was established to serve as a center for providing guidelines for the proper development and management of inland fishery resources of the Member Countries, which could consist of freshwater, saline water and mixture of both, and distributed throughout the land such as rivers, lakes, floodplains, reservoirs, wetlands, estuaries, and inland saline systems. The properties of such resources are dominated by permanent, seasonal or intermittent occurrence of flooding and are used for fisheries and related livelihoods.

Specifically, IFRDMD is tasked to establish partnership with relevant organizations, such as Mekong River Commission, to mobilize and extend research results to the Member Countries; develop guidelines on basic data collection for routine monitoring activities of different types of inland habitats; provide the tools for assessment and management of inland fisheries resources that could be applied in the region; monitor the state and levels of exploitation of inland fishery resources in the region; provide scientific basis for proper development and management of inland fishery resources to the Member Countries; and serve as regional forum for cooperation and consultation on research, conservation and management of inland fishery resources among the Member Countries. Moreover, IFRDMD would also coordinate and implement programs to improve the capability of the Member Countries in the development, management and conservation of inland fishery resources, through a master plan that covers the necessary programs of activities to be undertaken for sustainable inland fisheries.

### Box 3. Program of Work of SEAFDEC/IFRDMD

To be able to carry out its functions, IFRDMD had initially developed its Program of Work and identified the corresponding strategies to be adopted in undertaking such programs:

1. **Compiling baseline information on policies and regulations related to inland fisheries in the ASEAN Member States (AMSs)**
  - Strategy 1.1** Gather and compile information related to inland fisheries policies and regulations from the AMSs
  - Strategy 1.2** Provide accessibility of such baseline information in consultation with the AMSs
2. **Enhancing the awareness of AMSs on the status of inland fishery resources in the region**
  - Strategy 2.1** Assess the applicability of existing scientific data and information, and the effectiveness of data collection tools
  - Strategy 2.2** Develop the mechanism for collecting scientific data on inland fisheries, and guidelines
  - Strategy 2.3** Engage the AMSs and relevant agencies in collecting scientific data and in generating useful information for policy formulation
  - Strategy 2.4** Increase the visibility of IFRDMD as an information hub for inland fishery research and development
3. **Formulating policy recommendations and guidelines on inland fisheries management in close coordination with the AMSs**
  - Strategy 3.1** Formulate and disseminate policies and guidelines on inland fisheries management in the AMSs
  - Strategy 3.2** Support the adoptability of policies and guidelines on inland fisheries management by the AMSs

volumes of harvest should be utilized in an effective manner, such as fish preservation to allow people access to year-round supply of fish products for consumption. This effort would require the promotion of improved post-harvest technologies and handling processes to ensure the quality of fish as well as development of value-added products. Another equally crucial concern is on the fact that boundary of most water bodies could not be confined within a single management area. Therefore, management of such water bodies should be done with the involvement of several sectors and stakeholders through a “catchment approach” or “ecosystem approach” taking into consideration different levels of management authorities at the local, national, sub-regional, or regional levels as appropriate. The foregoing issues and concerns are among the priorities that would be addressed by IFRDMD with functions that dovetail towards sustainable development of inland fisheries in the Southeast Asian region (Box 2), through its initial Program of Work as shown in Box 3.

## References

FAO and NACA. 2003. Myanmar Aquaculture and Inland Fisheries. RAP Publication 2003/18. Australian Centre for International Agricultural Research; Network of Aquaculture Centres in Asia-Pacific; and Regional Office for Asia and the Pacific, Food and Agriculture Organization of the United Nations, Bangkok, Thailand; 60 p

- Kartamihardja, E.S. 2015. The Success of Fish Stock Enhancement and Restocking in Inland Waters of Indonesia. Paper presented during the SEAFDEC Symposium on Strategy for Fisheries Resource Enhancement in the Southeast Asian Region, Pattaya, Thailand, 27-30 July 2015. Southeast Asian Fisheries Development Center, Bangkok, Thailand
- Chumnarn Pongsri. 2015. Sustainable Utilization of Water Resources: Fisheries Perspective. Paper presented during the World Water Week, 23-28 August 2015, Stockholm, Sweden
- SEAFDEC. 2010. Fishery Statistical Bulletin of Southeast Asia 2008. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 135 p
- SEAFDEC. 2011a. Proceedings of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 20020: Adaptation to a Changing Environment,” Volume I: The Conference Proceedings, 13-17 June 2011, Bangkok, Thailand. Southeast Asian Fisheries Development Center, Bangkok, Thailand; pp 211
- SEAFDEC, 2011b. Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020. Southeast Asian Fisheries Development Center, Bangkok, Thailand; pp 15-16
- SEAFDEC. 2011c. Fishery Statistical Bulletin of Southeast Asia 2009. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 149 p
- SEAFDEC. 2012. Fishery Statistical Bulletin of Southeast Asia 2010. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 143 p
- SEAFDEC. 2013. Fishery Statistical Bulletin of Southeast Asia 2011. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 133 p
- SEAFDEC. 2014. Fishery Statistical Bulletin of Southeast Asia 2012. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 135 p
- SEAFDEC. 2015. Fishery Statistical Bulletin of Southeast Asia 2013. Southeast Asian Fisheries Development Center, Bangkok, Thailand; in press
- Try, Ing and Hort Sitha, 2011. Promoting Effective Fisheries Co-management through Community Fisheries in Cambodia. *In: Fish for the People* Vol. 9 No. 2 (2011). Southeast Asian Fisheries Development Center, Bangkok, Thailand; pp 73-78

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