

Sustainable Management of Inland Fishery Resources in Myanmar: Issues and Concerns

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Management of inland water fisheries has been promoted in Myanmar for decades as means of developing the country's fisheries in a sustainable manner, preventing the extinction of fishery resources, and safeguarding the health of freshwater fishery resources and habitats. For management purposes, the country's inland fisheries had been divided into: leasable and open fisheries. In leasable fisheries (locally known as Inn leasable fisheries), the fishing rights are granted through a lease agreement with the Department of Fisheries (DoF) of Myanmar subject to stipulations relating to the area, species, fishing implements, fishing period, and methods used. Open fisheries are operated in all other inland areas and waters adopting all kinds of fishing operations, with the right to fish in such areas also licensed by DoF including the fishing gears used. The leasable fisheries at Myaung in Bhamo Township, Kachin State which had been adopting sustainable management, serves as a demonstration site for other leasable fisheries in Myanmar.

the Chindwin about 960 km long, Sittaung (560 km), and Thanlwin (1,300 km). Ayeyarwady River which originates from Mainland China, traverses the entire length of the country from north to south, and drains into the Andaman Sea. According to Welcomme (1985), the water discharge of Ayeyarwady River is 13,000 m³/sec from a catchment area



Map of Myanmar showing the Ayeyarwady (Irrawaddy) River

Myanmar is one of the largest mainland countries in Southeast Asia with a land area of 656,578 km² and population of about 51.5 million based on the 2014 Myanmar Census. The country is endowed with inland water resources composed of riverine and estuarine systems. Its extensive river system comprises the Ayeyarwady (formerly known as Irrawaddy) River which is about 2,170 km long and its tributaries are

Table 1. Fisheries production of Myanmar (2008-2012)

	2008	2009	2010	2011	2012
Total Fisheries Production					
Qty (metric tons (MT))	3,147,605	3,491,103	3,901,979	4,149,799	4,417,676
Value ('000 US\$)	3,156,405	5,283,701	5,821,638	6,065,596	7,067,139
Inland capture fisheries					
Qty (metric tons (MT))	814,740	899,430	1,002,430	1,163,159	1,246,460
Value ('000 US\$)	788,325	1,349,145	1,503,645	1,744,738	1,869,690
Freshwater aquaculture					
Qty (metric tons (MT))	605,552	670,773	772,397	761,697	785,733
Value ('000 US\$)	641,278	664,260	724,138	736,975	1,134,881
Mariculture/brackishwater aquaculture					
Qty (metric tons (MT))	48,303	53,390	78,122	55,123	52,693
Value ('000 US\$)	141,288	208,905	193,568	203,690	213,465
Marine capture fisheries					
Qty (metric tons (MT))	1,679,010	1,867,510	2,048,590	2,169,820	2,332,790
Value ('000 US\$)	1,585,514	3,081,391	3,400,287	3,580,203	3,849,103

Sources: SEAFDEC (2014), SEAFDEC (2013), SEAFDEC (2012), SEAFDEC (2011), SEAFDEC (2010)

of about 424,000 km², which is located entirely in Myanmar. In addition, the inland water resources of Myanmar also include seasonal floodplains of about 8.5 million ha, other water bodies about 1.3 million ha, freshwater aquaculture ponds about 29,000 ha, and reservoirs of about 115,960 ha. These inland water resources had produced for Myanmar in 2012, about 1.3 million metric tons (MT) of fish from inland capture fisheries valued at about US\$1.9 billion and about 786,000 MT from freshwater aquaculture valued at about US\$1.2 billion (SEAFDEC, 2014). The country's production from inland capture fisheries which accounted for about 28% of its total fisheries production in 2012 and freshwater aquaculture contributing about 18% (**Table 1**), demonstrates the importance of inland fisheries to the country's economy. Almost entirely associated with livelihoods in rivers and estuarine areas, inland fisheries in Myanmar has been playing an important role in supplying fish to its populace, especially those in rural areas. Currently, the Department of Fisheries (DoF) under the Ministry of Livestock, Fisheries and Rural Development of Myanmar has the key role in the management of the country's fishery resources.

Management of Inland Fisheries in Myanmar

Inland fisheries has been practiced in Myanmar since 1864 during the British Rule of the country and managed in accordance with fisheries rules enforced since 1872. Since then, inland fisheries had been managed in accordance with the fisheries rules. However, considering that the country's fisheries production had been decreasing, the government promoted leasable fisheries and enacted the Fisheries Act in 1905, which identified the boundaries of leasable fisheries, auction system and fishing period in the leasable fisheries.

After a change of the country's administrative system in 1991, the country enacted the Freshwater Fisheries Law. Based on such Law and for management purposes, the country's inland fisheries have been divided into leasable and open fisheries.



Net enclosure constructed around leasable fisheries area

In leasable fisheries, also known locally as Inn leasable fisheries, the fishing rights are granted through a lease agreement with the DoF subject to stipulations relating to the area, species, fishing implements, fishing period, and methods used. Open fisheries are also allowed based on the fishing license or floating tenders issued that specify the fishing grounds and any other methods that could be used in all inland water areas except in leasable fisheries.

Leasable fisheries also serve as conservation areas and production promotion sites based on collaborative arrangements among the lease owners and the DoF. However, the short-term lease period of one-year created some concerns as the lessees also had short-term outlooks for the fisheries and did not think of investing more in the fisheries and were not anxious to conserve the resources. As a matter of fact, this led to over-exploitation of resources as the lessees tended to maximize their catch without having thoughts on the sustainability of the fishery resources. Thus in 1909, the long-term lease system was adopted as means of preventing the extinction of indigenous species and depletion of fisheries habitats, sustaining fish production of leasable fisheries, monitoring and controlling illegal fishing in the lease areas, and promoting responsible fisheries practices in the lease areas.

In 1988-1989, the long-term lease permission program was suspended but was restarted in 1992. Under this resumed program, lease owners granted the long-term permission have to undertake various activities such as repairing the waterways where fish migrates, enhancing the fish stocks in the lease areas, and promoting the conservation of fisheries habitats. Considering that such activities could not be completed in one year, DoF grants the lessees long-term permission from 3 to 9 years. Thus, the lessees do not have to bid again for the auction and pay high fees for their lease areas during the lease period.

In order to promote the production and conservation of indigenous species, DoF has initiated culture-based system and capture-based system in leasable fisheries since 1997. At present, most of the lessees have been conducting these systems since these have provided them beneficial returns. Such practices in leasable fisheries have been promoted by the DoF as ways and means of obtaining sustainable fish production and at the same time promoting conservation measures. Since then, nearly 500 leasable fisheries have been permitted to operate long-term lease arrangements annually. Among the long-term leasable fisheries, Myaung leasable fisheries in Bhamo Township, Kachin State which adopted sustainable management, had served as demonstration site for other leasable fisheries in the country.

As leasable fisheries progressed, some of the lease areas had been observed to be deteriorating due to siltation, agriculture operations, mining, and road and dam construction. The

deteriorated habitats coupled with illegal fishing and overfishing resulted in the depletion of the fishery resources that eventually led to overall decreases in the country's fish production from inland capture fisheries. Thus, the DoF finally established guidelines for preventing further decline of habitats and fish stocks, especially in the lease areas based on long-term lease agreement of three years. Since then, stipulations in the lease agreement include the conditions spelled out in the guidelines (**Box 1**).

Box 1. Guidelines detailing the responsibilities of lease holders (lessees) in the lease areas

- Submit to DoF proposal for long-term operation of lease area including workplan
- Upon issuance of lease agreement, implement the workplan under the supervision of DoF
- Conduct regular repair of waterways where fish migrates, and promote stock enhancement and conservation of fisheries habitats based on culture-based and capture-based systems
- Promote conservation of indigenous fishes by adopting capture-based system
- Enhance fisheries production using culture-based system by stocking fish seeds during the transition, *i.e.* nursing fish seeds in net enclosures in pens or cages or earthen ponds prior to releasing them to lease areas
- Rehabilitate the habitats in order that wild fish would reach the spawning and nursing grounds in the lease areas, *e.g.* deepening of shallow waterways, removing fallen trees and small bushes as well as other aquatic growth, creating spawning and nursery grounds in some areas along the migration route

As for open fisheries, all fishing gears are licensed by DoF. However, for some larger gears such as bagnets set in rivers, the right is licensed through a tender system, also known as floating tender. The DoF also regulates the operations of open fisheries, *i.e.* as these fisheries are not allowed to operate during the closed season from May to June of each year to allow spawning and recruitment of fish stocks.

Model Leasable Fisheries in Myanmar

With the main objective of conserving the inland fisheries habitats and fish stocks, the DoF has been conducting many activities in collaboration with leasable fisheries stakeholders. One of the most successful long-term leasable fisheries is



located in Myaung of Bhamo Township, Kachin State in the northern part of Myanmar. Recognize for its successful management that led to increase in fish production, the Myaung leasable fisheries had been used as model and demonstration site for other leasable fisheries to learn lessons from. Awarded during in auction in 2013-2014, the Myaung lease area consists of river channels connected to the Ayeyarwady River, where the main channel is managed by the lease holder while in the small channels, other fishers are allowed to fish by the lessee.

Based on the proposal submitted to DoF for the operation of Myaung leasable fisheries, the lessee has been allowed to operate in the lease area for a period of three years from 2014 until 2017. The stakeholders of Myaung leasable fisheries established that one of the most important factors that led to their success in managing the lease area is the regular cleaning of the waterways or canals as well as removing vegetations that grow in the waterways, to facilitate the migration of spawners. Furthermore, the activities that have been conducted in the lease area are in accordance with the workplan submitted to DoF (**Box 2**) and other relevant conditions (**Box 3**). The lessee also adopts culture-based and capture-based culture systems in the lease area, and a fishpen is constructed inside the area to rear indigenous fish species and culture some commercial species. The fish outside the fishpen is also nurtured and fed to enable the fish to grow to marketable size. The concerned stakeholders depend on the fish harvested outside the fishpen for their consumption especially during the closed season (June-August). Selective harvesting has also been applied in the Myaung leasable fisheries in order to sustain its fish production.



(left) Clearing of debris and other clogging materials from migration routes; (center) transferring nursed fish seeds from pens to lease area; (right) transferring indigenous fish juveniles to lease area

Box 2. Workplan of Myaung leasable fisheries for 2014-2017

May	<ul style="list-style-type: none">Preparation of fisheries habitat and maintenance of waterways<ul style="list-style-type: none">Digging shallow waterways, removal of fallen trees, small bushes and other aquatic vegetationConstruction of net enclosure (fishpen in the lease area)
June-August	<ul style="list-style-type: none">Wild fish is lured using feeds or baits and collected in the lease area, while seeds of cultured fish are reared in the fishpen
September-October	<ul style="list-style-type: none">Liming of the fishpen area to prevent water pollution
September-March	<ul style="list-style-type: none">Fishing periodLessee and concerned stakeholders harvest fish outside the net enclosure (fishpen)Selected breeders and undersized fish are transferred to fishpen for nursing

Source: Kywe et al. (2015)

Box 3. Other conditions in the workplan of Myaung leasable fisheries

- Daily patrolling of the lease area by fishers' team of the lessee to prevent poaching, fish poisoning, electro-fishing in the lease area especially during the closed season
- Fishing gears allowed in the lease area: drag nets, cast nets and lift nets, and to some extent, set gill nets. Lessee inspects the mesh size of nets used by other fishers in the lease area
- Migration and reproduction of fish should be ensured in the lease area, while good water quality and health of the habitats should also be promoted
- Catch by species, size and weight especially for commercial fishes should be recorded and reported to DoF
- Indigenous fish species and some cultured species incidentally caught in the lease area should be released to natural water bodies

Source: Kywe et al. (2015)

Legal Framework Relevant to Inland Fisheries Management

The DoF of Myanmar formulated a new Freshwater Fisheries Law in 1991 to ensure that the changing conditions in the country's inland fisheries are taken into account, which the 1905 Burma Fisheries Act had inadequately covered. In addition, having been empowered by the Forest Law of 1992, the Government has declared that all mangrove forests are protected areas, and fishing within three hundred yards of such mangrove areas is strictly prohibited. Meanwhile, the most relevant regulations under the 1991 Freshwater Fisheries Law are shown in **Box 4**.

Issues and Concerns

Various approaches and related activities had been tried by the DoF of Myanmar for the sustainable management

of leasable fisheries, e.g. giving back 1.0% of revenues to the inland fisheries sub-sector through a stocking program; return of 30.0% of revenues to long-term lease holders in the form of grants for improved management that includes: environmental rehabilitation, restoration and enhancement; clearing of floodplain channels to allow improved access of fish to the feeding and breeding grounds; and rearing of fish in pens within the lease area. Although the impacts of these factors are difficult to monitor and record, production and revenues are however reported to DoF, especially with respect to the trend of production from leasable fisheries. Nonetheless, one of the main concerns of the inland fisheries sub-sector of Myanmar is proper compilation of production and other data for planning and policy-making purposes. For example, data from reservoir fisheries are not compiled by DoF because reservoirs are under the control of the Ministry of Agriculture and Irrigation. Even if fishing in reservoirs is officially not allowed as means of allowing fish stocks to recover, fish is still harvested from reservoirs since these water bodies are restocked regularly. As a consequence from such practice, the catch had not been included in the country's statistical reports until 2000.

The Union of Myanmar is divided into States and Divisions, which are then divided into districts then to townships then lastly to villages. All fisheries license holders are required to report their catches to DoF through designated local township

Box 4. Regulations relevant to fisheries management stipulated in the 1991 Freshwater Fisheries Law

Closed fishing areas: 30 areas reserved for leasable fisheries had been identified for protection and management to ensure survival of juveniles of commercially important fish species, and these are located in Yangon, Pago, Sagaing, Mandalay, and Ayeyarwady Region.

Closed fishing season: for all freshwater fisheries, fishing is not allowed from May to July.

Protection of spawners, breeders and fingerlings of freshwater fishes. Species that should not be caught, exported, killed or kept in captivity without permission from the Director General of DoF, especially during the closed season are identified.

Prohibited trading of spawners, breeders and fingerlings of the giant freshwater prawns *Macrobrachium rosenbergii* and *M. malcolmsonii*: catching, exporting, selling, killing or keeping in captivity of such species especially during the closed season is not allowed without permission from the Director General of DoF. In case of accidental catch, these should be released immediately to natural water bodies.

Prohibited trading of the African catfish *Clarias gariepinus*: import, export, culture, production, sale, propagation or possession of the African catfish (*Clarias gariepinus*) is not permitted.

Prohibited fishing gears: fishing gear that is destructive to the environment and fishery resources are banned, as well as electro-fishing and fishing that uses poisons, chemicals and explosives, and other gears that obstruct the waterways such as those in dams and banks of rivers.

officials. Specifically for leasable fisheries, the lessees keep records of the fisheries, especially the catch records which are collected by designated local officers. In all cases, there is no sampling of the catch although reports are required especially for large gear, while some township officers were reported to have estimated the catch when these are not available from the lessees. After compiling the reports every two weeks, the township officers submit the reports to the central offices of DoF on a monthly basis. The officers are supposed to verify the catch records and other information through ocular inspection and field visits in the lease areas or fishing locations for open fisheries. However, such approach is not usually undertaken since many officers at township level only work part-time on fisheries statistics, as they have other duties in the township that include fisheries extension. In the case of leasable fisheries, the catch is reported in terms of value and quality (*i.e.* high and low quality), but information from open fisheries is reported by volume only and not by any category. Nevertheless, in both fisheries, there is very limited information on species composition.

It is in this aspect that collection and compilation of fisheries information should be improved, and could include: weight and species of fish caught, weight of feeds for fish outside and inside the fishpens, information on stock assessment of cultured species and wild species, and results of analysis of monitoring and evaluation of fish production. Nonetheless, it should also be considered that the Government has been giving more focus on agriculture extension, mining and industrial development. Given the importance of fisheries, especially inland fisheries to food security of the country, the fisheries sector in general and inland fisheries in particular, should also be given equal attention as other sectors. Specifically for leasable fisheries, support from the Government is needed in the reconstruction and/or maintenance of waterways considering the high labor and machinery costs. In addition, since the process of annual auctioning of leasable fisheries had been found to result in over-exploitation, such system should be reviewed and revised accordingly.

Conclusion and Recommendations

For the sustainability of inland fisheries, habitat conservation should be promoted as this is important for the growth and propagation of fish. In leasable fisheries, selective fish harvesting should be enhanced to ensure sustainable fish production and resources conservation while leasable fisheries should be sustained as these have the potentials for resources and habitat conservation compared with open fisheries. Information collection and sharing of knowledge and experiences among stakeholders should be improved. Moreover, sufficient supply of quality seeds of indigenous species should be produced in hatcheries for stock enhancement of the species.

Based on the experience of Myaung leasable fisheries, similar approach should be promoted in other areas of the country for the sustainable production of fish which could supply the nutritional requirements of local people especially during the closed season. Since conservation of indigenous species is already developed, lessees should be encouraged to provide breeders to DoF-operated hatcheries as well as to backyard hatcheries operating near the lease areas. In general, there is a need for the Government to put more emphasis in the conservation of freshwater fishery habitats and resources as well as in the extension of long-term lease awarded to responsible lease holders.

On the part of the DoF of Myanmar, an analysis of the impact of cultured species on the wild species should be conducted based on regular surveys. There is also a need for DoF to conduct R&D on the rehabilitation of critical fisheries habitats and the results of which could be applied in leasable fisheries. Over-all it still remains a great challenge for Myanmar to manage its fisheries, more particularly its inland capture fisheries.

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