

Sustainable Aquaculture and Resource Enhancement in Myanmar

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Abstract

Myanmar is located in a rising global fish demand zone for both processing and fish consumption, and has relatively rich land, water and coastal resources, as well as a diversity of agro-climatic conditions. Myanmar has taken its first major step towards developing a sustainable aquaculture industry that will meet domestic nutritional needs and support the fishery export business at a time when wild fish stocks are declining rapidly since 1990. At that time, Myanmar fishery sector has effectively performed for raising aquaculture production capacity in different States and Regions. Recently, freshwater aquaculture is into commercial production of over 20 species and nearly 10 species of indigenous species were successfully done at experimental scale. Most of the Myanmar people live in rural areas and they can easily access fishery resources in their place for daily food needs and create jobs. The aquaculture sector has been performing priority projects towards sustainable management of marine and freshwater fisheries to address overexploitation and climate change impact.

Myanmar DOF has initiated projects to ensure food security, food safety, and environment friendly and sustainable development of aquaculture sector through cooperation with local, regional and international organizations. Myanmar aquaculture sector would like to need improve aquaculture value chains, environmental sustainability, and competency of staff. This could be done through application of advanced technology and cooperation with international organizations through research and development programs for seed production in marine finfish.

Introduction

The Government of the Union of the Myanmar has a total land area of 676,580 km². It has a total coastal line of 2,832 km. It has four major river systems, including several large estuarine delta systems, as well as permanent and seasonal freshwater bodies with a total of 82,000 km² that provides habitat for a considerable diversity of aquatic species. In 2017-2018 fiscal year, the total production of fish was 5.87 million metric tons in Myanmar. In

this period, the production of freshwater fish was 2.72 million metric tons and the production of marine fish was 3.15 million metric tons. The exported amount of fish and fishery products was 0.57 million metric tons and the value of which was 711.72 million in USD. It was exported to 46 different countries. The exported amount was 10% of the total production of fish in Myanmar in this period.

The fisheries sector has advocated ensuring food security, food safety and sustainable

development of fisheries sectors by conservation of fisheries resources in accordance with the fisheries law as policy. In order to aquaculture sectors is initiate conservation of indigenous species and conducting research and in breeding and culture of those species, allowing import of high quality fish/shrimp seeds/broodstock and producing genetically improved fish species, adoption of climate smart fish species and their related breeding and culture technique, collaboration with regional and international organizations for preventing and controlling of fish/shrimp disease, cooperation with public, private and local/international organizations for the promotion of sustainable aquaculture activities, and Strengthening the development of environmental friendly aquaculture system such as Good Aquaculture Practices to align with ASEAN guideline according to EU market requirement.

Sustainable aquaculture

Freshwater aquaculture

Freshwater finfish farming commenced in 1953. Currently, over 20 species of freshwater fishes including common carp, indian major carps, Chinese carps, tilapia, *Pangasius* and walking catfishes and Pacu are being cultured in 27 government hatcheries stations. Freshwater fish culture is dominant aquaculture and 95 percent of Myanmar aquaculture are major carp such as rohu, mrigal and catla. Aquaculture provided animal protein intake of population and job opportunities along value chain. Rohu (*Labeo rohita*) has become key aquaculture commodity. These major carps are widely distributed across the Indian sub-continent, encompassing countries such as Pakistan, India, Bangladesh, Nepal and Myanmar. These major carps also had been widely breeding in the whole Myanmar

aquaculture (statistic of Myanmar, 2009). Major producer countries include India, Myanmar and Bangladesh (FAO, 2009).

In addition since the 19th century Myanmar aquaculture division has done fish restocking into a number of water bodies to replenish the depleted wild populations and enhance the freshwater fisheries resources (statistic of Myanmar, 2008). Therefore, Network of Aquaculture Center in Asia-Pacific (NACA) supported scholarship for master degree to identify genetic diversity of hatchery and wild populations of *Cirrhinus cirrhosis* (Bloch, 1795) at Kasetsart University in Thailand. The outcome of this master degree study was to obtain levels of genetic diversity of hatchery and wild populations of mrigal, and to provide recommendations for the genetic management and sustainable use of genetic resources of mrigal (Aung, 2009). After this study, Aquaculture Division was tasked to produce quality fish seed not only for genetic improvement and selective breeding program of rohu but also broodstock management of other hatcheries brood fishes following the result on genetic status of wild and hatchery populations of mrigal in Myanmar.

These hatchery stations conduct research studies on potential indigenous species in collaboration with international organizations. Hatcheries station want to research on local species but difficult to get budget for research. Ice cold areas in northern part of the country have less developed fish culture due to limitation of – topographical favorable condition, remoteness of mountain and difficult access. Formerly, consumers bought fish products from other area for food security with high price. Recently, aquaculture sector has established backyard hatchery to produce seedstock of common carp, Chinese carps and tilapia for grow-out culture and stock enhancement.

Marine aquaculture

Most common and prioritized species are the commercially important giant freshwater prawn, *Macrobrachium rosenbergii* and *Penaeus monodon* (tiger shrimp). Shrimp ponds are mostly along the coastal region since 1980 with trap and hold system. Most of the prawn farmers practiced the polyculture system stocked with freshwater prawn and fish to minimize the operational cost. Myanmar DoF and SEAFDEC/AQD early started mangrove friendly shrimp culture in 2002 with few farmers due economic constraints. Now a day, three types of culture systems are practiced: extensive, extensive plus and semi-intensive. DoF encourage fish and shrimp culture in every states and regions for environmentally non-degradation and technically appropriate. Farmers buy brood stock from Bay of Bengal and Andaman Sea. Government Hatchery stations and private hatcheries are faced with the problem of insufficient amount of breeders to produce in every years. Last year, farmers exported prawn/shrimp breeders to Thailand and other countries. Recently, farmers have been importing prawn/shrimp seeds from other countries because of the difficult requirements in local hatcheries and its high price. Since 2000, white shrimp started to be cultured and permitted include reasonable documentation in domestic water. DoF implemented standard operating procedure to prevent Tran-boundary aquatic animal diseases (TAADs). Trans-boundary aquatic animal diseases can rapidly impacts on biodiversity in the natural resources that limit the development and sustainability of the fisheries sector through production losses and other negative consequences such as direct and indirect impacts on livelihoods, increase operating costs, restrict trade, reduce market share and result in investment losses.

Marine species in Myanmar, mainly sea bass, groupers and red snapper are well develop in coastal aquaculture. They are formerly cultured using fry and juvenile caught from the wild. Now a day, grouper and seabass are hatched from DoF hatcheries (Myeik and Chaung Thar) and private farms. Commercial scale Grouper net cages culture are being practiced at Kyun Su Township (Myeik area) in Taninthayi Division. Grow-out culture of seabass is an on going activity and expected to have development potential in the near future.

Meanwhile, mud crab fattening has become the booming industry as domestic consumption and export demand are growing rapidly. At the same time, supply of crab juveniles from nature is decreasing due to over exploitation, habitat deterioration caused by human impact. There is a need to do more research and extension work for the dissemination of mud crab culture techniques to local small scale farmers and the conservation of mud crab resources, such as by setting up of protected ares of no crab fishing zone or conservation of mud crab habitats such as mangrove. At present, make smart company has extended the culture area of *Eucaema cottoni* and also constructed processing plant and storage building to accommodate production of 8,000 tons per year.

Management practices

Myanmar is one of the member of ASEAN countries, The Department of Fisheries of Myanmar already initiated Good Aquaculture Practices (GAqP) as ASEAN standard in fish and shrimp farming since 2011. DoF established the Directives and Regulation for prohibiting the use of chemical in aquaculture for food safety. At present, fisheries communities are more

interested in GAP guideline according to the market requirements. Indeed, aquaculture sectors try to practice GAP fish/shrimp/crab farming in the whole country.

From Farm to Table Approach in Aquaculture Products for Export responsibilities are following with monitoring and inspection. Monitoring plan will be performed in fish farms as follows:

- (1) surveillance of fish farm to examine disease infection and water quality,
- (2) quarterly update on the awareness of the GAqP guideline in hatchery stations; and
- (3) monthly sample collection in fish farms for examination under the National Residue Monitoring Plan.

Inspection plan implemented on fishery products in the lab are as follows:

- (1) pathogenicity test to detect the presence of Viruses/Zoonotic Parasites on fishery products and live organisms for export,
- (2) microbiological tests including for *Escherichia coli* and other coliforms, *Salmonella*, Total Plate Count, and
- (3) analysis for the presence of chemical residues, veterinary drugs, contaminants and histamine.

Research

Nowadays, *Silonia silondia*, giant butter catfish (Nga Myinn), is a potential species for culture considering its demand in local markets and for being rare in the wild

populations. There was a collaborative study on *Silonia silondia*, between the Department of Fisheries of Myanmar, Yangon University, and Tokyo University of Marine Science and Technology in Japan. Samples were collected monthly along the Ayeyarwady River for one year to determine genetic diversity. The samples were taken to Tokyo University for age determination based on growth rate, body length, and gonad weight. Samples were also reared, using developed broodstock management techniques, in two hatchery stations under the government.

Resource enhancement

In the field of aquaculture, a total of 48,672 fish and shrimp farmers were involved in various aquaculture systems. Since Myanmar's aquaculture is mainly based on pond culture system and mostly male labours are working in fish/shrimp ponds. Land use for extension of fish pond is permitted by local authority. Size of fish pond varies from less than one hectare to 40 ha depending on geographic situation. Productivity also varies 1,500 kg to 5,000 kg/Acre/year depending on type of culture operation. Twenty-seven hatcheries under DoF and 37 private hatcheries has managed to produce freshwater fish fry and fingerling for stock enhancement as well as for local consumption. According to DoF, hatcheries release the hatchery bred fish seeds into open bodies of water.

In order to maintain sustainable catch from inland fisheries, fishery stations have conducted yearly stocking of quality fish seed and juveniles into inland water bodies such as rivers, lakes, man-made reservoirs, canals, paddy fields and inundated areas. In the coastal area, shrimp hatcheries release hatcheries seeds into the ocean every year but cannot do so for marine fish seeds. Myanmar aquaculture sector lacks production techniques for marine finfish.

Mangrove forest protect and re-plantation program, collaboration with Forest Department, Local authority, NGOs and Local people. Other conservation and adaptation measures of freshwater fisheries are maintenance or reconstruction of water channel of leasable fisheries and mangrove re-plantation in the leasable fisheries. Department of Fisheries is collaborating with the fishers and fisheries stakeholders to conserve the freshwater resources and habitats. Capture based culture system is collecting the fingerlings of indigenous species or commercial species in the leasable fisheries and nursing in the fish pond or main channel of the leasable fisheries. While they grow up, they are released in the flooded area or rice field during rainy season. This system is favorable for the conservation of indigenous species or commercial species and for the promotion of fish production.

Biofloc and aquaponic techniques are performed by the aquaculture sectors but not in fisheries communities. Disease infection mostly occur in fish farms during the hot season. Lime, urea, zeolite/

dolomite, salt and T-super are used during pond preparation and to control disease. Currently, 70% of fish farms follow recommendations by the aquatic animal health disease section. The aquaculture division should be able to produce sufficient amount of prawn/shrimp seed for the local farmers with the implementation of Better Management Practices on biosecurity and aquatic health management, monitor persistent and emerging parasitic/bacteria disease in fish farms, and improved brood-stock management by vaccination to maintain aquatic animal health.

Conclusions

Aquaculture sectors had released hatchery bred quality fish seeds into the freshwater fisheries resources but has difficulty on the availability on data collection input and output results. For the sustainable development program, most of the project coordination and collaboration are with the Aquaculture Division. The aquaculture sector is sustainable if fisheries communities followed regulations, directives, guideline and fishery laws in Myanmar.

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