# Myanmar: status of implementation of the *Resolution and plan of action on aquaculture*

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## ABSTRACT

This report discusses the long term and short-term project plans for aquaculture development such as the expansion of farming area and management plan for supply of good quality seed through promotion of strains of parent major carp stocks. The report also includes the successful and unsuccessful activities on environment-friendly aquaculture such as mangrove-friendly shrimp culture and organic farming practices. Recognizing the impacts of aquaculture on environment and impacts of improper practices on market trends, Myanmar Department of Fisheries is formulating *Good aquaculture practices* (GAPs) based on experiences of other Asian countries.

This report explains the role of human resource capabilities and development schemes at different levels and at the same time decentralization that enhances the necessary core expertise that will address issues on disease, nutrition, hatchery and grow-out technology. Moreover, the report expresses the promotion of livelihood of the rural people through small-scale aquaculture based on community and grass-root level through participatory approach. It reveals the future prospects and proposed concepts on resolution of emerging world climate challenges towards the economical and sustainable aquaculture development.

The *ASEAN/SEAFDEC Fisheries millennium conference* that was held in Bangkok in November 2001 came up with the *Plan of action on sustainable fisheries for food security for ASEAN region*. The plan of action which was categorized into fisheries management, aquaculture, sustainable utilization of fish & fishery products, fish trade, and regional & international policy formulation was adopted to guide the member countries in developing the programs, projects and activities for implementation of the resolution. This report discusses the status of implementation of the *Resolution and plan of action on aquaculture* in Myanmar.

## Status of implementation of the *Resolution and plan of action on aquaculture*

**Supply of good quality seed**. Among the cultured organisms, rohu (*Labeo rohita*), stripped catfish (*Pangasius hypothalamus*), sea bass (*Lates calcarifer*) and seaweed (*Eucheuma cottonii*) are the most common and commercially cultured species in Myanmar. In order to promote and distribute quality fish seeds, the Department of Fisheries (DoF) has upgraded the broodstocks through its 27 fishery stations that deal with seed production and provision of technical assistance to farmers. The status of domestication of wild stocks and promotion of quality broodstocks of the various species is described below:

ROHU

Rohu (*Labeo rohita*) is the most common commercially cultured species which is native to Myanmar. Wild rohu becomes sexually mature upon reaching the age of at least 4-5 years and minimum body weight of 5-6 kg. Repeatedly induced-bred rohu may attain sexual maturity after two years and sometimes less than 2 kg of body weight. This slow growth and the faint coloration of the fish have been recognized as indicators of genetic deterioration of broodstock. In this connection, the DoF, in collaboration with the private hatchery, has domesticated the rohu wild stocks which are now being utilized as new generation stocks. The *Law on aquaculture* that was promulgated in the country in 1990 prohibits the collection of fry and fingerlings from the wild to conserve and enhance natural fish stocks. However, to develop the country's aquaculture particularly in producing quality seed, hatchery farmers with prior permission from DoF are also allowed to collect the fry and fingerlings. In view of this, the rohu aquaculture industry has become more developed and promising.

TILAPIA

Black tilapia or *Oreochromis mossambicus* was the first species introduced in 1953. However, its frequent breeding resulted in degradation and congestion of stocks in the pond which consequently caused this species to become notorious and neglected in Myanmar. The private sector introduced the Nile tilapia (*O. niloticus*) and the technologies for monosex seed production and grow-out culture. The seed production technology which is based on hormone treatment started in 2005 and since then has become popular as a promising industry. However, due to the early occurrence of the onset of breeding in tilapias (within 6-8 months culture), the local farmers are demanding for adequate supply of reliable and guaranteed quality of tilapia seed. This has spurred the need to develop breeding and genetic improvement technologies.

STRIPED CATFISH

About 500 fingerlings of *Pangasius sutchi* were introduced to Myanmar in 1990 through collaboration of Thailand and Myanmar DoF on the culture of domesticated exogenous broodstocks and production of seeds for grow-out culture. Myanmar DoF officials and private investors also brought from Vietnam some fingerlings of 'basa' catfish and domesticated these as broodstock. Since then, the private sector has made enormous investments in hatchery, grow-out culture and advanced processing plants for filleting of catfish. However, due to economic sanction problems, the progress of this initiative has been hampered.

SEA BASS

In terms of marine fish farming, seabass *Lates calcarifer,* red snapper and grouper are the most common and commercially cultured species. The fish seed for stocking were initially collected from the wild. Since 2004, the seed production technology of seabass has been successful in both the DoF and private sector hatcheries. The induced-bred seabass are now being used as broodstock. However, the grow-out culture of seabass is done only by a few farmers and this is due to the fact that adequate supply of trash fish and formulated feed have become inconsistent. Overall, DoF Myanmar carefully assesses the quality of broodstock strains and promotes proper broodstock management to produce better quality seed.

SEAWEED

The farming of the seaweed, *Eucheuma* sp. was started in 2003 through the collaboration of DoF, a Korean private company and Japanese International Cooperation Agency (JICA). The Korean company brought in the seaweed *E. cottonii* (Fig. 1) and domesticated this for use as seed stock of other private farmers.

**Environment-friendly aquaculture**. In 2000, the Ministry of Livestock and Fisheries reinforced and encouraged many potential investors to be involved in the shrimp aquaculture development. At the same time, the Union of Myanmar formed a state level

**Figure 1**. Farming the seaweed *Eucheuma cottonii* (left); and fish farmers preparing to stock cages

**Table 1**. Existing shrimp pond areas of different culture systems

| Culture system | Shrimp pond area (ha) |
|---|---|
| Extensive | 67,774 |
| Extensive-plus | 10,081 |
| Semi-intensive / intensive | 2,128 |
| **Total** | **79,984** |

committee to promote a rapid development of shrimp aquaculture industry by formulating the first three-year concept plan from 2000 to 2003 and the second plan, from 2003 to 2005. Since 2000, the country has witnessed an increasing number of semi-intensive and intensive shrimp farms (Table 1).

There was success and failure in semi-intensive and intensive shrimp culture. In 2002, a pilot demonstration on mangrove-friendly shrimp culture was conducted to verify the semi-intensive shrimp culture technique through collaboration of Myanmar DoF and SEAFDEC/AQD. A few private shrimp farms applied the mangrove-friendly aquaculture (MFA) technology with success but later due to declining market and shrimp price constraints, shrimp farming is being done only by a few farmers.

Apart from this, Myanmar DoF has mandated the aquafarmers to comply with biosecurity measures issued by DoF. To facilitate the practice of responsible aquaculture, DoF is preparing the guidelines on *Good aquaculture practices* (GAPs). There is still a need to educate the aquaculture farmers on GAPs through implementation of HRD schemes.

As part of the initiative to help mitigate the impacts of aquaculture on the environment, the intensive shrimp farms and soft-shell mud crab farms use a waste water treatment system. Part of the system is a large earthen pond that is used to hold the waste water collected. Tilapia species are also stocked to feed on plankton.

Myanmar DoF also promotes the importance of responsible introduction of new or exotic species to prevent the entry of invasive alien diseases. The DoF allows introduction of the exotic species provided this same species will be used for culture purposes and that guidelines will be followed prior to its introduction which include risk analysis and health certification.

Another issue that is being addressed in the aquaculture sector is the conflict with other land and water users. Land is originally owned by the government and based on government policy, only fallow land is allowed for aquaculture purposes. With regard to the use of open water, public use and navigation are priorities over aquaculture.

**Getting out of the fish meal trap**. Most of the freshwater fish farms utilize rice bran, ground-nut cake, cotton seed cakes. However, in tilapia and 'basa' catfish culture, formulated feed pellets that are manufactured by the private feed meal companies are used. The feed ingredients commonly used are broken rice bran, ground nut cake, soybean cake, and fish meal with vitamin mix; however, the actual feed formula and feed conversion ratio are not known. On the other hand, soft-shell mud crab farming and marine fish farming are thoroughly dependent on trash fish. Initially, feed pellets for marine shrimp and freshwater prawn culture were imported from Thailand but later on the local private feed mill companies were established to supply the local needs. There are few semi-intensive and intensive shrimp and prawn farms that have been established. In this regard, the demand for feed has decreased which eventually led to closure of the feed factories in view of their difficulty to finance the operating cost.

The alternative sources of fish meal are ground nut cake and soybean cakes, both locally available and consisting of high levels of crude protein. There is no practice of feeding farm-made pellet. However, a few large commercial farm owners are operating their own feed mills to produce feed pellets for their own farms while these feed mills are under experimental operation.

**Healthy and wholesome aquaculture**. The ASEAN Australia Development Cooperation Program - Regional Partnership Scheme (AADCP-PRS) established the projects that focus on strengthening aquatic animal health capacity and biosecurity in the region. In this regard, DoF formed the Myanmar Aquatic Animal Health Committee that prepared the contingency planning and national strategy for aquatic animal health & biosecurity and the national list of important diseases. Myanmar DOF established a fish disease section and implemented Levels I, II and III diagnosis with the collaboration of NACA.

SEAFDEC/AQD also assisted in sending its disease experts to Myanmar to study some important viral diseases. There are mobile teams that dispatch disease technicians to areas where diseases are occurring. In the case of some identified diseases, the disease section accessed the AQD experts for guidelines and therapeutic treatments. In the year 2008, a field-side laboratory was implemented in Ayeyarwady Division to survey and monitor the health management of surrounding freshwater fish ponds.

**Biotechnology for aquaculture.** Myanmar DoF has an Institute of Fishery Technology that is conducting occasional training on a variety of subject (aquaculture, capture fishery, quality control) for its in-service staff and rarely for the public sector. At the same time, the Myanmar Fisheries Federation, an NGO, is conducting regular training on aquaculture in collaboration with DoF, SEAFDEC, universities and external resource persons. Although workshops and seminars are being held, no evaluation and recommendation came out to convince the ministry and/or policy makers. There are also some short-term training programs on aquaculture at village level in collaboration with DoF and JICA.

On the other hand, DoF has been involved in close relation with fishery institutes within the ASEAN region since 2000. Moreover, eight of the DoF staff were sent to higher education programs in developed countries with masteral and doctorate level scholarships.

However, biotechnology for aquaculture has been confronted by challenges. Core experts in the field of aquaculture specifically on disease, nutrition, aquaculture chemistry, economics, taxonomy, genetic engineering and other aquaculture technologies are still lacking. In view of this, Myanmar is lagging behind in terms of mariculture compared to other member countries.

**Aquaculture for rural development**. One of the national policies is to address poverty alleviation and to carry out rural development through the efforts of agriculture and other sectors. Actually, about 70% of the population are living in the country-side and remote areas. DoF is mandated to conduct rural development schemes through aquaculture and small-scale fishing but because of the financial problems, the implementation has not been very effective. JICA incorporated and collaborated with DoF by establishing a JICA unit at DoF and initiation of the project in 2005. The project (Table 2) includes (i) conducting on-site training on small-scale aquaculture for the village people at appropriate areas; (ii) implementing a demonstration activity based on self-participatory approach; and (iii) JICA's provision of 70% of the cost of village level community farming. Profit sharing basis is to keep 50% for the next operation, 20% for donation to the nearby school or village clinic and 30% is to share for community members.

**Table 2**. List of activities under DOF/JICA

| Year | Activity | |
|---|---|---|
| | Type | Number |
| 2005-2008 | Paddy *cum* fish culture | 4 |
| | Culture of baby clam | 1 |
| | Paddy *cum* prawn culture | 4 |
| | Seaweed culture | 1 |
| | Backyard fish hatchery | 3 |
| 2007-2008 | Backyard fish hatchery | 1 |
| | Training with teaching aids | |
| 2008 | Backyard fish hatchery | 2 |
| 2009 | Community fish farming | 1 |
| | Community fish farming | 1 |
| | Community seed production | 5 |

The JICA project will be completed in June 2012. Based on evaluation of effectiveness and capacity needs, JICA is supposed to continue projects in Myanmar.

Another on-going effort of NGO is the *Ecosystem conservation and community development initiative* (ECCDI). This is affiliated with World Conservation Society (WCS) and is planning to conduct village level training on small-scale aquaculture which later will also support the village-owned fish ponds particularly at Nargis-hit areas.

## Problems encountered

**Supply of good quality seed.** Myanmar DOF has established 27 fishery stations that are mainly responsible for seed production, appropriate research and technical assistance to farmers. These stations are bound to seed production quotas with an average of 25.3 million seeds/year. The disadvantage however, is that prioritization of quantity could compromise seed quality.

The lack of budget and the necessary expertise are the major constraints in upgrading the broodstock quality through high health management and screening methods.

**Environment-friendly aquaculture.** Generally, most aquaculture farmers lack awareness on the importance of protecting the environment. Hence, nowadays, aquaculture is full of challenges and one of these is the need to educate the farmers and enhance their capacity particularly in mitigating the potential impacts of global climate change. Overall, there is a need to develop proper environment friendly aquaculture which is based on technology verification and technology demonstration in farms.

**Getting out of the fish meal trap.** There is variety of sources of plant protein that can be used in feed formulation for aquaculture. There is a need to establish research laboratories to formulate and produce pellet feeds that are suitable and economical to the targeted species. Normally, by-catch from fishing vessels are utilized for local consumption and for fish meal. However, in the long term, too much by-catch may cause stock depletion in fishery resources as these are playing important role in food chain of natural resources.

**Healthy and wholesome aquaculture.** There are no core experts in fish disease and only a few technicians are permanently assigned in the disease section while others are transferred very often to other sections. Another problem encountered is the limited number of staff assigned in the disease section. The main drawback is the lack of technical know-how on aquaculture which may have resulted also in wrong diagnosis and treatment. Anyway, field-side laboratory is effective and enhances the ability of the disease technician to know more about culture pond environment and get in touch with farmers.

**Biotechnology for aquaculture.** Biotechnology plays a very important role in aquaculture development. Fishery stations are basic units for seed production and research and development. However, the technicians are bound to seed production. Furthermore, the staff who are holders of Master and Ph.D. degrees are not keen to work in the field and they are concerned only with what will make them more experienced through practical oriented activities. There is also a need to develop marine fish and coldwater aquaculture and to address their major problems which include the lack of technology and financial support.

**Aquaculture for rural development.** Rural development through small-scale aquaculture has been effectively done by JICA. Despite this, the implementation of community development schemes are faced with social problems. Rural people are very poor and when they become involved in community through the participatory approach, the families of community members usually face a problem of meeting their daily income for their daily meal. Moreover, the success of community based farms is always challenged by poaching. There is a need to develop rural development through proper conceptual plan, with consideration of the social and livelihood situation of the proposed project area.

## Future plans at national level and regional cooperation

### National level

COLDWATER SPECIES

Some cold water aquatic species are naturally existing in the northernmost part of the country where temperature is very low. As part of rural development effort, Myanmar DoF is planning to develop a pilot scale grow-out culture and a backyard hatchery, and to educate the local ethnic group.

Currently DoF officials and farmers have visited Vietnam and studied development of aquaculture. Some private companies are interested in sturgeon farming. In this regard, the culture of sturgeon has been included in the future plan through the biotechnology obtained from Vietnam.

MARINE FISH

The development of hatchery technology for marine fish with particular reference to grouper and snapper is another major plan of DoF (Anon. 2004).

MUD CRAB SEED PRODUCTION

There is an urgent need for an adequate supply of mud crab seed for soft-shell mud crab farming; hence, this has been included in the future plan. Moreover, the hatchery operation performance gives very low survival rate. Myanmar DoF has planned to expand more mud crab hatcheries at suitable areas based on success of the present hatchery operation (Anon. 2004).

GAPs

*Good aquaculture practices* are to be promoted in order to facilitate a wider practice in Myanmar. DoF has prepared a complete procedure on GAPs and has submitted this to the ministry. As part of this initiative, the department level and field-side level training on GAPs will also be conducted (Anon. 2004).

**Figure 2**. Myanmar participants and AQD expert during the *in-situ* training on mud crab farming; a berried female mud crab is inset

### Regional cooperation

Myanmar is a member country of NACA and SEAFDEC and is actively participating in the activities of these institutions (Fig. 2). The on-going JICA projects are under negotiation for continuous support for rural development projects through small-scale aquaculture.

## Recommendations

Myanmar DoF recommends the strengthening of capacity on and development of biotechnology with particular reference to marine fish, mud crab and coldwater species.

Myanmar DoF also recommends getting out of the fishmeal trap and substituting this with plant protein.

The low survival rate in mud crab seed production appears to be a major challenge in the development of mud crab aquaculture industry. Myanmar DoF recommends cooperation of regional institutions and among countries in the region by conducting more research studies in order to improve the survival rate.

## Reference

Anonymous. 2004. 30-Year Long-Term Plan on Fishery Sector Development