

A new freshwater aquaculture practice that has successfully targeted a niche export market with major positive societal impacts: Myanmar

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The 750ha Top Success Fish Farm produces around 4,000 tonnes of fish per year and is a major employer in the area.

Myanmar can be considered as a newly emerging aquaculture nation in Asia. In 2005-2006 the share of aquaculture accounted for approximately 22% to the fisheries sector. The production volume of the sector increased significantly in volume, 7.3 times in the last decade, or from 0.082 million tonnes in 1996/97 to 0.6 million tonnes in 2006/07. The great bulk of this aquaculture production is in freshwaters and consists of Indian major carps and to a lesser extent catfish and tilapia. The growth trends in the sector have been dealt in some detail previously (Win, 2004; Edwards, 2005).

Myanmar, particularly the southern states are blessed with vast quantities of freshwater, dominated by the Ayeyarwaddy and Salween River systems. Equally, it is blessed with a very rich freshwater fish fauna (Win, 2004). Some of the major culture species that are shared with neighboring countries such as India, Bangladesh and Thailand (De Silva et al., 2006).

In general, most aquaculture in Asia is composed of small holdings. In Myanmar too, this is so to a very large extent. However, a little known facet is that some aquaculture practices have developed and or transformed to cater to a fast developing intraregional

export market, essentially consisting of indigenous freshwater species such as *Labeo rohita* (rohu) *Catla catla* (catla), *Cirrhinus mrigala* (mrigal) and *Pangasianodon hypophthalmus* (pangas catfish) and the exotic tilapia, *Oreochromis niloticus*. Overall in Myanmar two aquaculture farming systems are recognizable, a differentiation that has come into being in the last ten years; small farms, often family managed and owned catering to the local demands and large farms, often vertically integrated catering to the export markets.

This larger farm enterprising venture towards the export market promotion is considered to have originated on a very small scale initially through a few business personnel who found a small export market for rohu in Bangladesh. Beginning about 12 years ago, this focus on the Bangladesh market has grown particularly in the last seven or eight years to other regions where there are considerable expatriate communities of Indian and Bangladeshi origin. Currently, the export earnings from freshwater fish are nearly US\$72 million, and in 2006 for example the exports to Bangladesh alone accounted for US\$26 million and the total exports of rohu is expected to reach US\$120

million in 2007. Interestingly some of this fish earlier was being re-exported to the Middle East, but now direct marketing is opening up. All exports of freshwater fish are predominated by rohu, which accounts for nearly 83% in volume and 79% in value. By comparison elsewhere in the region, the export of cultured catfish from Vietnam and tilapia from China are ranked first and second with this new market in Myanmar the third highest. This market diversification is expected to continue with continued exports to Bangladesh, but the bulk increasingly headed to Middle East, with a small market share in the UK and other European countries.

As the market expanded the production practices had to keep pace, not only in production volume but also regularity in supplies particularly delivering a product of uniform size and so forth. To meet these criteria the farms expanded into larger scale more integrated operations with a variety of changes such as a move to larger sized production ponds. Furthermore, to bring about overall efficacy in the production systems, hatcheries, nursery rearing and grow-out became separate entities as part of a total market-oriented production system. Often, all three systems are owned and operated by one enterprise.

The average grow-out farm size could be as large as 400 ha, with a pond size ranging from 2-5 ha. In the grow-out stage for rohu for example, the target stocking size is typically around 20cm or 150-170 g. Fish are fed locally made feeds using local ingredients and harvest size could vary from 1.5 to 2.5 kg or over 3kg depending on the export market demands. The grow-out will take ten to fifteen months to meet the respective marketable sizes. Feeding is often conducted by placing the feeds in strategic points in the ponds in perforated polythene bags dipped in water and the contents replenished on a regular basis (Ng et al., 2007). Whilst the carps are almost exclusively pond cultured there is a growing trend for catfish farming to be conducted in cages in the lower reaches of the Ayeyarwaddy system. In this case too, there is an integration between different stages of culture and the grow-out in cages is conducted on an extremely intensive basis such as for example a cage of 23 x 10 x 6 m being stocked with 80,000 x 60g fish at any one time, and grown to market sizes of 1.5 to 2.5 kg on a needs basis. *P. hypophthalmus* (in Myanmar referred to as pangus) culture has still not reached the levels of rohu. It is expanding, however. In all instances as the farms grow in size there is a division

of labour in the production system- multi-stage systems- where hatchlings, nursery rearing and grow-out are carried out as separate entities in space.

In all of the above activities there was an element of vertical integration and significant capital investment all supported by the Government of Myanmar through the provision of land leases, introducing relevant export regulations to meet or fulfill export quality criteria and putting in place efficient monitoring systems. To facilitate and enhance the sustainable development of the sub-sector, the Ministry of Live Stock and Fisheries provides loans to fish farmers through the Livestock and Fisheries Development Bank at the rate of 300,000 Kyats (approx US\$2,300) per acre (or US\$5,800/ha) with minimum interest. It is likely to increase up to 500,000 Kyats in the very near future. At present about 70% of the total bank loans are for fisheries and aquaculture development and related ventures.

The harvested products are processed in different forms depending on the market. For instance, whole ungutted fish of 1.5-2.5 kg are exported to Bangladesh on ice by boat taking approximately three to four days to

reach the designated port in Bangladesh. Fish processed for export are generally gutted, cleaned, glazed and then frozen whole for export to Middle East countries, the UK and elsewhere. The processing activities are carried out according to strict hygienic and HACCP system. In the processing factories, the offal and the air bladder is separated from the gonads and sold locally for extracting oil and some of it for local consumption. In some plants where there is vertical integration. For example, one catfish plant which produces fillets of 200-400 g from 1.5-2.5 kg catfish the frames; the head and skin from the processing and strips of recovered flesh resulting from the processing are utilized to manufacture their own fishmeal (one tonne per day) which in turn is mixed with locally available other ingredients (soybean meal, palm oil cake, groundnut cake, rice bran, also see Ng et al., 2007) and pelleted into a feed of 20-27% protein content by dry weight (70 tonnes per day) exclusively for feeding catfish in grow-out cages in the Ngawun River and in nursery ponds.

The social impact of these aquaculture activities cannot be solely measured in terms of monetary value. It is clear that a large number of people have



Processing operations at Grand Wynn Manufacturing Co.



Rohu are blast frozen for export.

This article emanates from a NACA mission comprising of Sena S. De Silva, Hassanai Kongkeo, Thuy T.T. Nguyen and Simon Wilkinson in May 2007 to various aquaculture sites in Yangon and Ayeyarwaddy Division and extensive discussions with personnel from the Department of Fisheries, the Myanmar Fisheries Federation, farmers and processors. During the farm visits the mission was accompanied by U Myint Soe, Assistant Director, Department of Fisheries, Myanmar.

The article emphasizes the relatively recent developments in aquaculture in Myanmar which have revolved around the production of quality fish, species which elsewhere would be categorized as relatively less high-valued, consisting mostly of Indian major carps, and in particular rohu, *Labeo rohita*. It is targeted that the rohu exports for 2007 to reach US\$120 million. These developments have brought about major changes in the culture practices and marketing, as well in the development of ancillary services such as feed developments using local ingredients, transport services and most of all in the processing industry, which currently has provided employment for approximately 2500 persons, mostly women. These developments have been made possible through governmental support in the provision of land leases, licenses, loans and others. Further more these developments are suggested to have had no significant negative impact on the availability of fish for local consumption.

found employment in the processing plants, the increased labour required to run larger farms have been part of the overall business development leading to a significant contribution to the Myanmar GDP. Myanmar now has 143 processing plants of varying capacity 81 of which specifically cater to processing rohu, pangas, and other cultured freshwater fish for export. Overall, it is estimated that the processing industry for freshwater fish provides employment to 2,400-2,800 persons approximately. In addition, new employment opportunities have been created as a result of the large farm sizes and the expanding transportation and distribution networks.

While aquaculture across Asia is generally facing problems of inbreeding and associated genetic deterioration of stocks due to lack of strategic planning in broodstock management, the situation in Myanmar appears to be well under control in this regard. This is probably the result of planned use of naturally available seedstocks for continued replenishment of the broodstock for hatchery rearing, thereby minimizing potential inbreeding. Myanmar

is able to adopt this strategy because it is blessed with abundant water and natural fish seed resources, where hatcheries for aquaculture can recruit new broodstock at regular intervals from the wild (wild fry and fingerling catching is controlled strictly by the Government), currently at five year intervals for rohu.

In Myanmar aquaculture also goes hand in hand with conservation by releasing seedstock from hatcheries into adjacent natural waters from where broodstock originated. As well, the genetic aspects of the present broodstock management and stock enhancement strategies are being studied in detail to bring about



The Htoo Thit Pellet factory - ramping up capacity to 1,000,000 tonnes/year to meet the growing demand for pellet feed.



Above: The Yuzanna Group's *Pangasianodon hypophthalmus* culture in large floating cages in the Ayeyarwaddy Delta - each cage can hold 80,000 fish, harvest size is 1kg+ achieved in 6 months. Below: Feeding time inside the cage.





Than Zay retail market, Yangon.

rather unusual when compared to that of the rest of Asia. The developments have been possible due to availability of large areas of land and reliable sources of good quality water, and government rendering the required backing to aspiring businesses. It is also important to note that the aquaculture developments in Myanmar are not overly stressing these systems, at least currently, by adopting very high stocking densities and feeding rates, apart from cage culture of pangasid catfish in rather fast flowing rivers, as has happened elsewhere. Consequently, these production strategies appear to be sustainable in the longer term.

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further improvement so the current broodstock management program(s) and restocking program(s) could be made even more effective and of greater conservation value.

The question arises whether these developments in the culture practices have impacted on the local population in terms of affordability of fish. Fish is the main source of animal protein in Myanmar currently estimated at 41 kg per caput per year, one of the highest in the world. There is no ready answer to this question. At a regional level, past and present data suggests that there is a significant amount of relatively small scale aquaculture practices operating for supplying local consumer needs.

The limited information suggests that the preferred size for consumption locally is less than 1.5 kg sized fish, the desired size being indirectly linked to the income level. There is no evidence to believe that local fish prices in Myanmar have increased to any greater extent than other consumer/common food items, indirectly indicating that the aquaculture developments may not have had a direct impact on the local consumption patterns. As described above, these aquaculture developments have created significant employment opportunities with significant income generation to the community, which would positively impact on standards of living and food security. We felt that this series of developments in Myanmar are



Chaungthar Hatchery, Department of Fisheries - rohu dominates seed production.