

A future for the tilapia in Bangladesh

By M. G. Hussain

A tremendous progress in its farming is being achieved with improved strains and expansion of culture areas.

In Bangladesh, freshwater aquaculture systems mainly revolve around the polyculture of various species of carps (both Indian and Chinese carps) and in varying combinations and densities depending on the availability of seed. The monoculture of the pangasiid catfish is a recent practice using improved management methods. However, costly feed and low market price has slowed progress in farming of this fish. In the case of the giant freshwater prawn (*Macrobrachium spp*) and tiger shrimp (*Penaeus monodon*) which are primarily cultured in coastal areas, farming is near to collapse because of disease outbreaks (white spot syndrome and yellow head virus). A mass involvement of rural communities in carp and shrimp culture is also difficult due to limited water and financial resources.

Under such conditions, progressive farmers and entrepreneurs have been looking for alternative species which can maximize production and profit. Among them, the tilapia is the best candidate, due to several desirable characteristics. A new avenue for extensive tilapia farming in Bangladesh was also possible with the introduction of a synthetic strain of *Oreochromis niloticus* ie. GIFT strain in 1994 through WorldFish Center (formerly ICLARM) under the DEGITA project and development of further genetically improved strains by Bangladesh Fisheries Research Institute (BFRI). This was followed by the dissemination of these strains and low cost and appropriate aquaculture technologies to producers.

According to the Fishery Statistical Yearbook of Bangladesh (DoF 2009), tilapia production in Bangladesh was about 66,767 tonnes in 2007. During 1999 to 2007, there was a tremendous progress in tilapia farming in this country. Production increased from 2,140 tonnes in 1999 to 66,767 tonnes in 2007 (Figure 1). Due to the rapid expansion of hatcheries producing monosex all male seed, and farms within a span of 2 years (2005-2007), tilapia production increased more than three folds in Bangladesh.



BFRI Super GIFT Strain of tilapia

GIFT and red tilapia strains in Bangladesh Stock improvement

The GIFT strain was developed by WorldFish Center through several generations of selection from a base population involving eight different strains of Nile tilapia (Eknath et al. 1993). BFRI received the first batch of the GIFT strain tilapia in 1994 and later 116 families of

the same strain in 1996. The on-station and on-farm trials conducted by BFRI, the GIFT strain was reported to show 35-57% superior growth performance in comparison to the existing local strain of the country (Hussain et al. 2000).

Further stock improvement of GIFT using mass selection technique was initiated in 1998 and continued until 2004. Meanwhile, 6 generations were developed and the F6 generation progeny showed 32.66% higher growth than that of average group of GIFT strain. Initially, the rate of genetic gain in weight of fish was greater up to the third generation and afterwards it gradually decreased. The reason behind such a declining trend in genetic gain in particularly for body weight might be the accumulation of inbreeding. Therefore, the genetic improvement strategy for enhancing the growth of GIFT strain was re-designed and presently being implemented through family selection protocol by introducing an upgraded new stock of GIFT from Malaysia in March 2005.

Due to excellent performances for growth and relevant traits (survival, fecundity and disease resistance etc.) the newly improved strain has been renamed as BFRI Super GIFT strain. Presently BFRI, as a center of excellence for genetic upgrade of tilapia strains, is distributing on an average 0.3 – 0.5 million improved tilapia germplasm every year to interested farmers and entrepreneurs all over the country.

Production all male monosex tilapia

Optimization of hormone dose for the production of monosex all male GIFT seed production was performed for mass seed production. Subsequently the sex reversal technique has been disseminated to the public and private hatchery operators and presently about 70 monosex tilapia seed production hatcheries have been established under the technical supervision of BFRI in several regions of the country. These hatcheries are presently producing about 135-150 million monosex fry every year.

Development of true breeding red tilapia

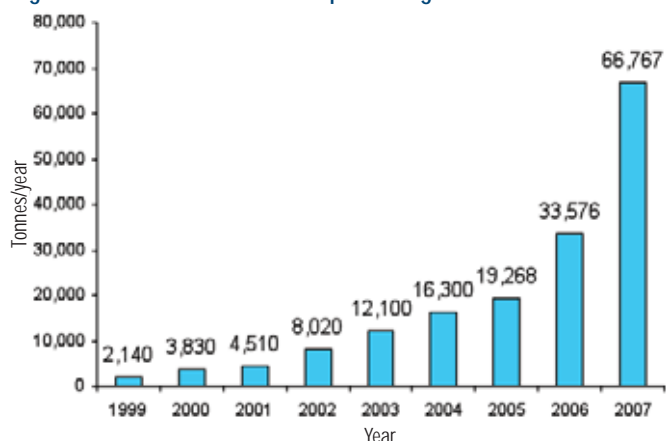
It was experimentally proven that the existing stocks introduced in 1988 (i.e. Thai red strain) were not true breeding (Hussain 1994). So, a new batch of red tilapia strain was brought to Bangladesh in 2005



Egg hatching jars

through the World Fish Center and progeny tested at BFRI through Mendelian Test Cross techniques. Malaysian red strain was found as true breeding, which can produce 100% all red progeny in breeding programmes. Currently, BFRI has further improved this strain by using a rotational selective breeding technique and initiated mass seed production for distribution and dissemination of breeding and culture techniques to interested farmers and entrepreneurs. Meanwhile, more than 0.1 million newly improved red tilapia germplasm have been distributed during the last breeding season (2008).

Figure 1: Production of farmed tilapia in Bangladesh from 1999 to 2007



Grow-out of tilapia

Land based farms

Currently, there are about 446 medium and large scale commercial farms involved in the grow-out of table size tilapia (Table 1). These farms have been established very rapidly within a span of 7 years (2000 – 2007). The average farm size is 10ha with an average of 20 ponds/farm. More than 90% of grow-out farmers stock their farming ponds with monosex BFRI Super GIFT strain at a density of 62,250 fish/ha. Moreover in about 500 farms, monosex and mixed sex tilapias are cultured with riverine catfish (*Pangasius sp.*) species. Presently, commercial farms are producing about 67,000 tonnes of marketable size tilapia (150-300 g). In most of the local markets the fish are

Table 1. Distribution of commercial tilapia farms in major districts Bangladesh.

Districts (Administrative Units)	No. of Farms
Comilla	60
Chittagong	25
Cox's Bazar	15
Kishoregonj	22
Rajshahi	25
Pabna	13
Mymensingh	50
Jamalpur	15
Khulna	55
Shatkhira	60
Bagerhat	30
Jenaidha	10
Dinajpur	16
Sylhet	22
Netrokona	10
Norshigndi	18
Total	446



Trays for egg hatching and larval development

marketed fresh but in chain super markets, chilled fish are sold. Tilapia contributes about 6.64% of total aquaculture production in Bangladesh (DoF 2007).

Cage culture

In Bangladesh, the Bangladesh Fisheries Development Corporation (BFDC) was the pioneer in experimental cage culture of Nile tilapia in Kaptai Lake, Rangamati in the 1980s. However, no production data is available. Subsequently CARE, Bangladesh conducted grow-out trials of BFRI Super GIFT strain in cages in the Meghna river lagoon area near Munshiganj in the 1990s (Hussain et al. 2000). CARE also implemented a CAGES project for more than 5 years with limited success as potential livelihood options in different sites in Bangladesh.

Recently, a number of private entrepreneurs have initiated tilapia cage culture in Dhakatia river near Chandpur and Munshiganj region. Table 2 shows data on culture period, stocking density and production of cage culture. In their operation, the stocking density varied from 200-350 fish/m³. After 8-9 months of culture, production ranged from 120 to 190 kg/m³, whereas the feed conversion ratio was around 2.00. Table 3 shows the cage culture data of some of the selected farmers.

Tilapia cage culture is gaining popularity day by day. Recently under

Table 2. Cage culture data of some selected commercial farmers.

Name of Farmers	Species used	Cage size (m ³)	Stocking density (no/m ³)	Duration (month)	Production (kg/m ³)
Md. Zakir Khan	Monosex GIFT	2.75	350	9	125-140
Md. Billala Khan	Monosex GIFT	2.75	350	9	120-130
Md. Alamgir	Monosex GIFT	2.75	350	9	130-150
Md. Sowakat Hossain	BFRI GIFT (mixed sex)	4.0	200	8	170-190

Table 3. Production of BFRI Super GIFT tilapia in tea estate aquaculture farms.

Name of Tea garden	Area of water body (ha)	Species stocked	Culture period	Production (tonnes/year)
Monipur tea estate	6.52	Monosex tilapia	5	120.00
Marina tea estate	2.0	Monosex tilapia	5	25.0



Culture in cages in Dhakatia river near Chandpur and Munshiganj region.

the Ministry of Fisheries and Livestock, Government of Bangladesh in collaboration with BRAC- an international nongovernmental organization have come forward to operate experimental cage farming in various parts of Bangladesh. Here tilapia will be the main species for culture.

Tilapia in irrigation ponds in tea gardens

Water bodies of tea estates are a new avenue of tilapia farming in Bangladesh. In Bangladesh there are about 163 tea gardens covering about 140,000 hectares of land. In each tea estate there are more than 30 ha of water bodies, which are mainly used for irrigation purposes during summer season. These water bodies could be used for fish culture especially, monosex GIFT tilapia farming. During, 2006 and 2007, Marina and Monipur tea gardens have initiated farming of monosex tilapia on an experimental basis (Table 3). These currently produce an average of 125 tonnes of monosex tilapia per year, which is very encouraging in the context of Bangladesh.

Technology dissemination and training

In order to disseminate the appropriate technologies of BFRI Super GIFT strain seed production, hatchery management as well as farming practices, a total of 50 government hatchery managers, and more than 300 private hatchery managers/entrepreneurs were trained in eight batches. They were taught monosex hatchery management systems, brood stock replacement protocols, implementation of simple breeding plans etc. Moreover, a total of 2000 progressive fish farmers were trained on improved BFRI Super GIFT strain all male monosex culture and management in ponds in twenty batches (Table 4).

The future for tilapia

Bangladesh has hundreds and thousands of seasonal water bodies in the form of ditches, shallow ponds, road side canals, barrow pits and it is without doubt, that these water bodies have tremendous potential

Table 4. Number of trainees on BFRI Super GIFT strain seed production and culture.

Criteria of Trainees	Batches	Number of Trainees	Name of the training course
Govt. Hatchery Manager	2	50	GIFT monosex seed production technology
Public/private hatchery operator/Entrepreneurs	12	300	GIFT monosex seed production technology
Progressive farmer	60	2000	GIFT monosex culture management



A new culture system in irrigation canals in tea gardens. There are 163 tea gardens covering about 140,000 ha available for tilapia culture.

for aquaculture. These are especially suitable for the culture of fish species with short life cycle, fast growth rate and require low input support (Hussain et al. 2000). In such cases, tilapia can be a promising candidate for aquaculture in suitable seasonal water bodies.

Recently, the low market price had severely damaged the farming of the exotic riverine catfish (*Pangasius hutchie*) in the country. Therefore a large number of commercial catfish producers have found tilapia as an alternative species to culture in their farms to maximize the production. In brackish water zones and coastal farms (200,000 ha) where improved extensive shrimp culture has collapsed due to disease outbreaks, commercial farming of tilapia will be an alternative.

In Kaptai reservoir (70,000 ha), lower Meghan and other southern river tributaries, lagoons, irrigation canals and other similar water bodies (1.03 million ha), intensive cage culture of monosex all male tilapia could boost up fish production. Suitable water areas in all the tea estates (140,000 ha) can be used for tilapia farming

Conclusion

Farming of the tilapia has a great potential in Bangladesh and it will be a prime culture species in the near future for freshwater and brackish water ecosystems. The way tilapia aquaculture is expanding at small, medium to commercial scale; it will not be long before the tilapia contributes to the bulk of aquaculture production. It will also be a major source of employment. It can be confidently said that in the near future Bangladesh will be one of the leading countries in Asian in tilapia production.

References are available upon request.



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