Tilapia Culture in Kuwait: Constraints and Solutions

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Abstract

Tilapia farming in Kuwait is in its early stages. Slow growth, high production cost and poor demand are the major constraints to the expansion of tilapia culture in Kuwait. This article presents some suggestions for overcoming these problems to improve the economic feasibility of tilapia culture in Kuwait.

Background

Tilapia is an African freshwater fish that belongs to the family Cichlidae and includes over 100 species. There is some evidence that the Egyptians practiced tilapia culture nearly 4000 years ago. Most of the commercially cultured tilapia is of the mouth-brooding genus *Oreochromis* in which females incubate the eggs in their mouth cavity. Cultured tilapia is a major source of fish protein in many countries around the world and the consumption of tilapia in both the developing and industrialized countries is increasing. There is an increasing interest in tilapia culture and it has been transplanted and stocked into waters of most countries of the world (Balarin and Hatton 1979; Eknath et al. 1993). Tilapia is currently ranked second only to carp culture and is likely to be the most important cultured fish in the 21st Century (Fitzsimmons 2000).

Tilapia has many attributes that make it suitable for culture. Among these are its general hardiness, high tolerance to adverse environmental conditions and overcrowding, its ability to withstand low oxygen and a wide range of salinity concentrations and its resistance to disease. Tilapia is able to survive and grow on a wide range of natural and artificial feeds, converts food efficiently, grows relatively fast, has a high yield potential and is accepted by a wide range of consumers. Furthermore, tilapia can be grown in a variety of culture systems, ranging from simple systems with little infrastructure to more intensive and complex systems.

Tilapia Research in Kuwait

The state of Kuwait is located in the Middle East (29° 30" North, 45° 45" East) and lies at the northwest corner of the Arabian Gulf. It is bounded to the north and west by Iraq and to the south and south-east by the Kingdom of Saudi Arabia. The Arabian Gulf is Kuwait's eastern border.

In an attempt to accelerate the development of the aquaculture sector in Kuwait and to partially compensate for the sharp decline in Kuwait's fisheries, the Kuwait Institute for Scientific Research (KISR) represented by the Aquaculture, Fisheries and Marine Environment Department (AFMED) began importing tilapia in the late 1970s. A number of research projects were conducted on the feasibility of culturing this species in the country. Initially, the research projects were on the determination of the spawning season and reproductive potential of tilapia species such as *Oreochromis spilurus*, the Taiwanese red tilapia hybrid, the blue tilapia *O. aureus* and the Nile tilapia *O. niloticus*. At a later stage, research was focused on more specific objectives, including the mass production of tilapia fry, maximization of seed production and improvement of the spawning synchrony through the manipulation of broodstock density and broodstock exchange (Ridha and Cruz 1999, 2000, 2003) and extending the spawning season by controlling water temperature, photoperiod and light intensity (Ridha et al. 1998). Because of the arid climatic conditions of Kuwait, the scarcity of freshwater and the abundant availability of seawater, research was also conducted to evaluate the feasibility of culturing the salinity-tolerant *O. spilurus* in seawater using different production systems, such as land-based tanks, raceways and floating marine cages. Research was also carried out to develop guidelines to overwinter fingerlings in sea water, to determine the optimum stocking density for floating sea net cages and to determine the optimum cage depth.

Marketing Studies

Preliminary marketing studies indicated consumer acceptance of tilapia and interest among farmers in growing tilapia. Kuwaitis represented 31-37 per cent of the buyers, with

the remaining buyers being mostly African and Asian expatriates.

A limited amount of underground low-salinity water, ranging between 2 and 10 ppt, with an average temperature of 26° C, is available year-round in the Wafra agricultural area located about 100 km south of Kuwait City and in the Al–Abdali area north of Kuwait City. Agriculture farms utilize this water to grow plant crops. In an attempt to increase the production of tilapia and to improve the profitability of the conventional agricultural farms, KISR conducted a study on integrating the culture of the *O. niloticus* within existing farms without increasing the utilization of groundwater. During the irrigation period, the effluent from the fish tanks carrying the solid wastes excreted by the fish was used to irrigate the alfalfa crop, thus providing the plant with the necessary nutrients for growth. At night, the effluent water was recycled to the fish tanks through a sand filter that removed the solid wastes. The study showed that it was possible to produce approximately 2.5 t of fresh tilapia annually together with alfalfa using a minimal amount of extra water. The most profitable scenario for the farmers was to double this production of tilapia with a feed subsidy of 50 per cent from the government (Al-Ameeri et al. 1999, 2000).

Status of Tilapia Culture in the Region

Tilapia farming in Kuwait is in its infancy. Records show that in 1986, there were three farms growing tilapia using low salinity underground water (2 to 10 ppt). By 1996, there were 12 farms culturing tilapia. A survey conducted during 1997 showed that a total of 37 fish farms had an estimated total production of about 31.5 t of tilapia (Al-Ahmed 1998). Currently, 65 farms grow tilapia (mainly *O. niloticus* and *O. spilurus*), with an estimated total production of 110 t (Al-Ahmed 2004). The price of tilapia ranges between US$4.50 and US$6.00/kg. Some farmers sell their fish on-site while others sell to small shops. In the Gulf Region, commercial tilapia culture is only practiced in Saudi Arabia, using intensive freshwater culture systems that depend heavily on the limited groundwater. The major tilapia species cultured are the Nile tilapia, the blue tilapia and red tilapia hybrids (El Gamal 2001). In 1986, a total of 16 t was produced in four farms, while in 1996, 52 tilapia farms produced a total of 2800 tons (Elhendy and Alzoom 2001).

Problems Encountered

A field survey conducted in some of the existing tilapia farms and in fish markets in Kuwait revealed a number of interrelated technical, economic and legislative problems and challenges that result in low production and low profitability of the farm, thus hindering the expansion of the tilapia farming industry in Kuwait. The production cost and, hence, the retail price of fresh tilapia is high. The factors responsible for this are insufficient supply of tilapia fry, slow growth rate of tilapia, high feed conversion ratio and the high cost of artificial feed. Most tilapia farms have poorly designed fish tanks and lack equipment such as air blowers, pumps, stand-by electrical generators and feed storage facilities. The lack of trained manpower to operate the farms successfully is a critical constraint on increasing production. Moreover, due to poor marketing and the lack of coordination among farmers in marketing their products, locally produced fresh tilapia is not able to compete with the imported fresh and frozen tilapia.

Solutions

The government should lay down the criteria and specifications for appropriate production systems for both small and large scale tilapia growers. Licenses and permits to grow tilapia should only be issued to farmers who have properly designed farms and adopt the recommended culture system. The growth rates and output of fresh tilapia in Kuwait can be improved by culturing the Genetically Improved Farmed Tilapia (GIFT) strain instead of the non-improved local strain of the Nile tilapia. Results of a preliminary study conducted at AFMED indicate that the GIFT strain has a significantly higher mean body weight, faster daily growth rate, better feed conversion ratio and higher production rate than the local strain (Ridha and Cruz 2002). The better feed conversion ratio of the GIFT strain would reduce production cost as feed accounts for over 50 per cent of the cost of production.

The government represented by the Public Authority for Agriculture Affairs and Fish Resources (PAAAFR) is currently in the process of establishing a tilapia hatchery for the intensive production of high-quality tilapia seeds from the GIFT strain. In order to decrease the financial burden on the farmers, the government hatchery should supply the farmers with the required quantity of the seed. Moreover, a government subsidy on feed of at least 50 per cent should also be continued to further decrease the production cost and increase the profitability of such farms. Establishing a local feed industry in Kuwait can fulfill the requirements of the farmers for good quality feed at a relatively low price.

If the annual production per farm can be increased to 5.0 t (Cruz et al.

2000) with government support as suggested above, the production cost could be reduced from US$5.4/kg to US$2.2/kg. The retail selling price of locally produced fresh tilapia would fall to around US$3.0/kg. This would make it more competitive with imported and other fresh fish in the market, and increase the demand for local tilapia. The market potential and the market share of cultured tilapia could be improved by establishing a farmers union that would be responsible for coordination among farmers and marketing of tilapia through advertisement. The government should also protect its national fish production against competition from imported fresh and frozen tilapia.

Conclusion

Properly designed fish farms, adoption of an appropriate tilapia production system by the farmers, a government subsidy on seed and feed, and the development of an organized marketing strategy would enhance the commercial viability and profitability of tilapia farming in Kuwait. This would contribute significantly to placing tilapia farming and marketing on a sound footing and establishing it as a growing industry.

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