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Intelligence

Tilapia farming in Honduras

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By Bartholomew W. Green, Ph.D.

Continued development of domestic and export markets will stimulate expansion of existing farms and development of new farms to meet demand

Tilapia grow-out ponds at Granja Mirador Sta Rita de Copan in Honduras.

Tilapia farming in Honduras began with the construction in 1989 of the Special Tilapia Project (Proyecto Especial de Tilapia, PETISA) farm, which was the first tilapia farm producing exclusively to supply the export market. This farm began operation in 1990 with 60 ponds having a total of 24 hectares of water surface. Interest in tilapia farming

increased during the early 1990s, aided by a campaign by the Honduran Federation of Agro-Exporters (FPX) promoting production of tilapia for export. FPX, which back then was a semiautonomous institution and is now an independent organization, was promoting non-traditional agricultural exports as part of an USAID-funded project.

The tilapia production system promoted by FPX was modeled after the one used in Jamaica. Honduran biologists who had worked with the Auburn University-Honduras Pond Dynamics/Aquaculture Collaborative Research Support Program (PD/ACRSP) were hired by FPX to provide technical assistance to producers. A number of other biologists and technicians who worked with the PD/ACRSP program also have gone on to work in the Honduran aquaculture industry.

Farm location and size

Since 1992, tilapia farming in Honduras has developed rapidly. Currently there are an estimated 160 ha of tilapia ponds in operation, in addition to cage culture operations on Lake Yojoa and the El Cajon Reservoir. While tilapia farms are located throughout the country, the majority are situated in the Sula Valley in northern Honduras, because of its warm climate and abundant water resources. Honduran tilapia farms can be divided into two groups: smaller farms with 3.5 to 9.0 ha of pond area that produce primarily for the domestic market, and larger farms with 12.0 to 25.0 ha of pond area that produce primarily for export markets.

Exports

When commercial tilapia culture began in Honduras, many producers hoped to export their fish to the US. However, the smaller farms soon encountered problems related to marketing their relatively small and periodic production, and turned their attention to local markets. Local markets in Honduras require smaller fish (250 grams minimum) than export markets (> 600-gram fish). Whole gutted fish (scales on and with gills) are marketed locally, whereas fresh fillets are the principal export product. Fresh fillets are shipped to markets via airfreight from San Pedro Sula. Farmers market fish locally on-farm and to retailers, restaurants and cafeterias especially in the duty-free industrial parks. The smaller farms supply the local market exclusively while the larger, more intensively managed farms export 84- 97 percent of their production.

Volume of tilapia exports to the United States is used as an indicator of growth in this industry in Honduras, given the absence of data on total annual tilapia production. The United States is the primary export market for Honduran producers, although some tilapia is exported to Europe. Exports of tilapia to the United States, primarily as fresh fillets, have increased annually since 1992 (Fig. 1). Growth in domestic demand for tilapia is expected to stimulate continued development of the industry. Honduran consumers, who purchase either whole or gutted fish, prefer red tilapia.

Continued growth in tilapia exports is expected because of new farm construction or expansion of existing farms. Larger farms have an average of 54 ponds and smaller farms have 33 ponds. Nearly 75 percent of pond area is used for grow-out, which generally is accomplished in two phases. Overall, 5.9 percent of total pond area is used for reproduction, 21 percent is used for nursery rearing, 31.8 percent is used for grow-out (phase I), and 41.1 percent is used for grow-out (phase II). Excavated ponds are most common. AquaCorporación de Honduras, a superintensive farm, uses excavated ponds for nursery rearing and concrete-lined 500-cubic-meter raceways for grow-out. Surface water is the predominant water source for most tilapia farms.

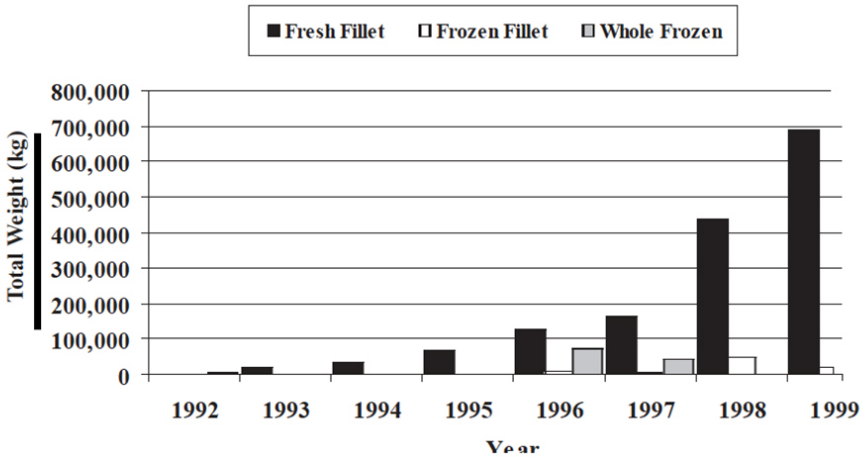

Fig. 1: Tilapia exports from Honduras to the United States as fresh or frozen fillets, and as whole frozen fish (1992-1999). Data from 1999 are for January through November.

Production procedures

Most farms stock a red tilapia that was imported from Jamaica eight to nine years ago. This fish is a hybrid fish line composed of genetic material from (*Oreochromis mossambicus, O. urolepis hornorum, O. aureus* and *O. niloticus.)* The Egyptian strain of Nile tilapia (*O. niloticus*) also is cultured on a limited basis in Honduras. Most fingerlings are produced on-farm, although off-farm purchases are made in response to production shortfalls. Fingerlings generally are produced in earthen ponds that average 1,200 square meters in size. Reproduction ponds are stocked with 11,000 females per hectare and 4,000 males per hectare; the ratio of female:male brood fish is about 3:1. Female and male brood fish average 323 grams and 460 grams, respectively. A locally manufactured, extruded, 30 percent protein diet is fed to brood fish at a mean daily rate of 1.9 percent of biomass, six days per week.

All farms stock male (sex reversed) fingerlings in production ponds. Fry to be sex reversed are harvested by seining the reproduction pond edges with fine-mesh nets. Partial harvests of fry begin 10 to 22 days after brood fish are stocked into ponds, and continue daily usually for 3 to 10 days. This method yields 20 to 60 fry per kilogram of female brood fish on a daily basis. Fry production decreases by 50 to 70 percent during November to February because water temperature is lower than 22 degrees-C. At farms located at higher elevations, tilapia reproduction ceases during December and January because water temperatures drop below 20 degrees-C. Reproduction ponds are drained following each fingerling production cycle. Pond bottoms are allowed to dry between cycles, and puddles that remain on pond bottoms are treated with chlorine solution or hydrated lime to eliminate any remaining fry.

Fry harvested from reproduction ponds generally undergo sex reversal in concrete tanks of 250 square meters average size. Mean fry stocking rate in tanks is 2,286 fry per square meter. Sex reversal is accomplished by feeding fry a finely ground feed with oral 17 alpha-methyltestosterone (MT) incorporated at 60 mg per kg feed. Treatment duration is 28 to 30 days. Fry average 0.4 grams after treatment. Survival during MT treatment averages 57 percent. Efficacy of sex reversal averages 94.4 percent males.

Tilapia cage module in El Cajon hydroelectric reservoir, Honduras.

After sex reversal treatment, fingerling are reared in 0.3-ha earthen ponds to an advanced fingerling size. Fingerlings stocked into ponds at an average of 26 fish per square meter grow from 0.5 to 37.1 g in 67 days. Harvest biomass averages 5,169 kilograms per hectare. Fingerling survival averages 71 percent. Fish are fed a 30 percent protein extruded feed, six days per week. On many farms, pond water quality is managed by exchanging from 5 to 20 percent of pond volume daily. Standing crop at harvest tends to be higher in ponds that receive water exchange (6,800 kilograms per hectare) compared to ponds without water exchange (3,538 kilograms per hectare). Aerators rarely are used in ponds during the nursery phase.

Most farms grow fish to market size during two grow out phases in 0.3-ha earthen ponds. During the 83-day grow-out phase I, fish are stocked into ponds at an average of seven fingerlings per square meter for growth from 39 to 150 grams. At harvest of grow-out I ponds, mean fish biomass is 5,040 kilograms per hectare, and 85 percent of stocked fish are harvested.

Fish stocking rate decreases to an average of 3.9 fish per square meter during the107-day grow-out phase II. Female fish are sorted and removed from fish populations as fish are transferred from grow-out phase I to grow-out phase II. Fish average weight increases from 155 to 414 grams during grow-out II. Average fish biomass at harvest of grow-out II ponds is 14,397 kilograms per hectare. Fish survival averages 90 percent. Fish are fed a 30 percent protein floating, extruded feed six days per week during both phases. Feed conversion ratios for each phase vary from 2.0 to 3.5:1.

Two farms practice more intensive culture techniques than those used for pond culture: raceway culture and cage culture operations in Lake Yojoa and the El Cajon hydroelectric reservoir. The raceway farm draws its water from the outflow of the Rio Lindo hydroelectric plant, which draws water from Lake Yojoa. Discharge from the hydroelectric plant varies diurnally from 13-23 m^3 per s; the supply canal to the raceway farm carries six m^3 per s from the hydroelectric plant discharge canal.

Production of stocker fingerlings is accomplished in earthen ponds at the raceway and cage culture operations, while during the grow-out phases, operations shift to concrete raceways or cages. On the farm using flowing water culture, grow-out phases I and II are conducted in 500-square meter concrete raceways. During grow-out phase I, fingerlings are stocked at 130 fish per square meter and grow from 64 to 360 g in the 121-day grow out period. Fish biomass upon completion of phase I averages 39.8 kg per cubic meter, and 85 percent of stocked fish survive. Stocking rate for grow-out phase II is reduced to 48 fish per square meter. Fish are grown from 360 grams to 925 grams in 131 days. Standing stock at harvest is 40.8 kilograms per cubic meter. Survival during grow-out II averages 92 percent. Fish in both grow-out phases are offered a 32 percent-protein extruded feed frequently from 0800 to 1600 h. On average, one complete raceway volume is exchanged per hour during both grow-out phases.

In the cage culture operation, 20-gram fingerlings harvested from nursery ponds are transported for stocking into cages for a two-phase grow-out. Cages (170 cubic meters) are grouped in modules of six cages, and each module is positioned 50 meters from adjacent modules. Fish are stocked into cages at 176 fish per cubic meter and fed a 35 percent protein extruded feed, which is offered frequently from 0800 to 1600 h. Duration of grow-out phase I is 60 days, at which time fish average 100 grams and standing stock is 12.4 kilograms per cubic meter. Grow-out phase I survival is 70 percent. Fish stocking rate is reduced to 35 fish per cubic meter for grow-out phase II. During the 10-month production cycle fish grow from 100 g to 800 grams. Fish are fed a 28 percent-protein extruded feed, which is offered frequently from 0800-1600. Standing stock at harvest is 22.5 kilograms per cubic meter, and survival averages 80 percent.

Tilapia reproduction ponds at Aquacorporacion de Honduras.

Conclusion

Tilapia farming has become an established aquacultural activity in Honduras since its beginnings a decade ago. The industry evolved from an exportonly orientation to one that supplies both domestic and export markets. Continued development of domestic and export markets will stimulate expansion of existing farms and development of new

farms to meet demand. The future looks bright for Honduran tilapia producers.

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Author

BARTHOLOMEW W. GREEN, PH.D.

Department of Fisheries and Allied Aquacultures
International Center for Aquaculture and Aquatic Environments
Auburn University, AL 36849-5419

bgreen@ag.auburn.edu (mailto:bgreen@ag.auburn.edu)