

History and Status of Commercial Tilapia Farming in Jamaica

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Fish farming began in Jamaica in the early 1950's when the Fisheries Division of the Ministry of Agriculture commenced a small-scale research and breeding program for *Tilapia mossambica*. Fish produced from the program were stocked extensively in most of the country's rivers and indigenous ponds. A large-scale commercial tilapia farming program was initiated in 1976, with the Government of Jamaica/USAID Inland Fisheries Development Project. Under this project the Inland Fisheries Unit was created to foster the development of the institutional capacity and technical experience to design and implement a nation-wide fish production program. A central office, support facilities and 40 ha of land were acquired for the development of a fingerling hatchery and food-fish production ponds through USAID for fiscal year 1977-79.

The economic feasibility of commercial tilapia production was demonstrated using *T. mossambica* fed a commercial poultry feed. During the period 1976 to 1979 more than 55,500 kg of food-fish were produced at the government facility. The first GOJ/USAID Project was concluded in August 1979 and a second GOJ/USAID Project (Fish Production System Development) was immediately initiated. *T. mossambica* was replaced by *T. nilotica*, and a specially prepared, locally manufactured fish feed was used. During this project, by June 1982, over 74,000 kg of food-fish were produced by the private sector.

The Inland Fisheries Project was initiated in 1977 through the joint efforts of the Government of Jamaica/USAID. The need for this project was justified by studies showing that: (1) Jamaica was a heavy importer of fish. Between 1968 and 1976, 18 million kg of fish were imported annually. This was restricted to 10 million kg in 1977. Of this, 4 million kg could be replaced by freshwater fish. (2) The poorest 70% of population had a per capita intake of protein in 1974 which fell below the FAO/WHO Recommended Daily Allowance (RDA) by 14%.

An initial project, carried out from 1977 to mid-1979, substantiated the technical and economic feasibility of freshwater fish production in Jamaica. The second phase, called "The Fish Production System Development Project," was implemented in July 1979 and is scheduled to continue until mid-1983.

The goals of this project are to increase food production, income of farm families, rural employment and optimal utilization of land. Other objectives are to improve nutrition in rural areas and help mitigate foreign exchange problems. To accomplish these goals the project has established two fish hatcheries, one in the eastern region and the other in the western region of the island. These two facilities have a total of 44 ha of ponds. To enhance our fish production methods the research facility at Twickenham Park was increased from 2 to 4 ha. The technical staff has also increased from 13 in 1979 to 20 in 1982.

Geographic Suitability Of Jamaica For Aquaculture

The island of Jamaica is 10,991 square km in area; divided into 14 parishes which, for management purposes by the Fish Production Project, were grouped into 2 regions, east and west, of 7 parishes each. Along the length of the country a continuous range of hills forms a "backbone" climaxing in the Blue Mountains on the eastern side. This is composed mainly of limestone, metamorphosed and volcanic rocks with thin overlays of soil. Surrounding these hills are the coastal plains. These lands are the most suitable for commercial fish farming. At present most of this land is under sugarcane cultivation. A large portion, however, is saline or swampy and of marginal value for traditional agricultural uses. The clay content varies, but in most

instances is sufficient to retain water.

The main rivers largely flow through land unsuitable for fish farming. Many streams run for short distances and then disappear underground into the limestone aquifer while others are seasonal, flowing only during the rainy season. Nevertheless, in some of the coastal areas river and well water is pumped into irrigation canals. Water for fish farming can be obtained from these canals.

In Jamaica the average air temperature is 27°C with less than 6°C seasonal variation during the year.

History Of Fish Farming In Jamaica

Jamaica is not rich in indigenous freshwater species of fish, and little work has been done on evaluating their potential for culture. *Tilapia mossambica* was introduced in the 1950's by the Fisheries Division, Ministry of Agriculture, into rivers, lakes and natural ponds to be exploited extensively by the general population. Only a small hatchery and research program was undertaken at that time. *T. mossambica* or African perch, therefore, became another species of freshwater fish which found its way into some of the households of the poorer sectors of the population.

In 1977, when the Inland Fisheries Project was initiated, this species was chosen for culture. Due mainly to consumer resistance because of its black color, *T. mossambica* was replaced by *T. nilotica*, Nile or silver perch, which was introduced in 1978 and first distributed to fish farmers in October 1979. Its greater acceptance by consumers is due to its silver-grey color, a deeper body (more flesh) and a smaller head than *T. mossambica*. It also has a faster growth rate and reproduces at a later age. Intensive culture of *T. mossambica* has now ceased and they can be found in large quantities only in the wild. The current method of producing tilapia in Jamaica involves brood ponds, nursery ponds and food-fish production ponds.

GROWTH OF COMMERCIAL FISH CULTURE

The Extension Program at Inland Fisheries was officially started in September 1979. Prior to this, there were only 15 subsistence fish farmers whose hand-dug ponds had a combined area of only 0.1 ha. Seven farmers with ponds large enough to be commercially viable had a total of 3 ha.

In 1979 the extension staff, consisting of six extension officers, five Peace Corp volunteers, one regional extension officer and one USAID advisor, began a drive to recruit farmers in the eastern half of the island. After an exhaustive assessment of six parishes, three were found to have very good commercial fish farming potential and one fairly good potential.

During 1980, when the Extension Program was expanded and made the general public aware of the potential of fish husbandry, 28 farmers with 38 ponds totaling 14 ha were put into commercial production. By the end of 1981 this number had increased to 43 farmers with 91 ponds totaling 32 ha. To date there are 63 commercial farmers in production utilizing 58 ha of water and 132 ponds. Thirty-two farmers have systems involving more than one pond. The largest farm in production is owned by the Urban Development Corporation, a statutory body of the Government of Jamaica. The first phase of this farm consists of 28 ha of ponds; the second phase being planned should increase the farm by approximately 40 ha.

Production data from private commercial farms indicate a continuous increase in the amount of fish produced, increasing from an initial rate of 4,400 kg in 1978 to 44,800 kg during the first 8 months of 1982 (Table 1).

The public sector farm (government-owned) is also a commercial producer of fish. In 1977, approximately 2,200 kg were sold, but in 1978 total production rose to more than 33,000 kg, sold mainly to the government-owned Agricultural Marketing Corporation which processed and marketed the fish. This agency phased out of the

Table 1. Annual production (kg) of food fish, *Tilapia nilotica*, in the public and private sectors in Jamaica from 1977 to 1982*

Year	Public Sector	Private Sector	Total (kg)
1977	2,200	-	2,200
1978 [†]	33,400	4,400	37,800
1979 [†]	17,200	8,300	25,500
1980	6,900	13,400	20,300
1981	7,400	25,000	32,400
1982 [§]	9,900	59,700	69,600

* Production figures include only documented harvests.

[†] During these years smaller fish termed "soup fish," were accepted at the government-owned processing and marketing plant. Since that time only the larger fish have been considered marketable.

[§] Annual production was estimated based on the production revealed during the first 8 months of this year.

marketing the following year, and total fish sales dropped to 17,000 kg annually as private distribution systems began to be developed. Since 1980 most of the government-owned fish production facilities have been used to supply male fingerlings for the private sector, but food-fish sales have gradually increased from 7,000 kg in 1980 to 8,000 kg during the first 8 months of 1982 (Table 1).

As mentioned, the main function of the Mitchell Town Fish farm is to provide fingerlings for the private sector production ponds. The number of male fingerlings distributed to the private sector increased from 12,000 in 1978 to 160,000 during the first 8 months of 1982. This, however, has not kept pace with the increase in the number of private ponds over the years. This resulted in longer down time between crops for farmers, thus reducing annual net profits from food-fish ponds. In an effort to alleviate this situation, the nursery pond system was introduced to farmers in March 1982. Farmers with greater than 0.4 ha were encouraged to construct nursery ponds. For small-scale producers the suggested size of a nursery pond is one-half that of the production pond. The management of these nursery ponds is presented in Cooper et al. (1983). In general, hatchery results in the private sector are similar to those obtained during the initial research (37,000 males per ha of nursery ponds during a 7-11 week rearing period).

Virtually all of the production cited (Table 1) has come from the eastern half of the island. Extension efforts are now being expanded to the western side with the recent completion of a support hatchery with 6 ha of ponds in that area.

Growing Independence Of Fish Farmers

Because of the previous lack of tradition in fish culture in Jamaica, farmers were initially provided with much government support, but now that farmers are developing their technical skills and have confidence in the economic feasibility of fish farming, these supports are gradually being removed. During the early stages of development, fish were sexed, stocked and harvested by project personnel. This service is being phased out as small groups of men are being trained as "sexers" to assist especially those farmers with nursery ponds. They will also be available to help in harvesting ponds using the farmer's equipment. To facilitate the farmers in this area, the project has a "farmers commodity" component which allows them to purchase essential fish farming equipment at cost. Until this is in place, ponds are still being harvested by project personnel at a charge high enough to encourage more farmer participation.

Male fingerlings that were once subsidized are no longer provided. This encourages the construction of private nursery ponds. Fry of approximately 1-g size are sold at cost price by the government facilities to the farmers.

FUTURE FOR JAMAICAN FISH CULTURE

The fish culture system presently expanded in the Jamaican private sector was first proven at the government facilities. Although *T. mossambica* was replaced by *T. nilotica* and a specially formulated diet has replaced the commercial poultry food originally used, little space was available to evaluate many variations of the basic production scheme. Now that 28 research ponds are available, investigation has begun on feed formulation, stocking densities and feeding rates in food-fish ponds. Improved techniques for fingerling production and large scale hormonal sex reversal are also being investigated.

To utilize pond productivity more efficiently, research is presently being conducted on two species of carps, the grass carp (*Ctenopharyngodon idellus*) and the common carp (*Cyprinus carpio*). These will eventually be used as secondary species in polyculture with *T. nilotica*. A species of small shrimp (*Macrobrachium amazonicum*) was also introduced as a potential species for polyculture. This small shrimp completes its life cycle within a pond, requiring no additional inputs for its production. The silver carp (*Hypophthalmichthys molitrix*) and the bighead carp (*Aristichthys nobilis*) were also introduced from Panama for use as secondary species in polyculture. Some brood stock will reach sexual maturity in 1983. Plans to introduce the cachama (*Colossoma spp.*) from Venezuela are now being finalized. It is impossible to know what conclusions will be drawn from this research, but one fact is certain: a simple but economically attractive fish culture system has developed in Jamaica, and only field-tested and proven modifications should be taken to the producers.