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I. Project Summary and Recommendation

A. Recommendation

-Grant (New AID Obligation) - \$355,000

B. Description of Project

1. Project Components

AID:

- 3 man-years of technical assistance in the field of warm water aquaculture.
- 9 man-months of short term advisory and training services.
- 3 persons trained at a graduate level in a technical aspect of aquaculture production at a U.S. institution.
- 1 man-year of short term training at a U.S. or third country institution.
- sufficient commodities to equip a fisheries research laboratory.
- 6 vehicles to maintain a fisheries extension program and distribute fingerlings to producers' ponds.

GOJ:

- Renovation of Twickenham Park and new construction of fish storage areas, ponds, and residence.
- Salaries for an increased staff (from 13.5 to 21.5 persons).
- Administrative and operating support.

2. Implementation

The project will be implemented by the Fisheries Division (Inland) of the Ministry of Agriculture. Technical assistance will be provided through an AID contract with a U.S. university with a demonstrated capability in the field of warm water aquaculture. The contractor will attempt to develop the capacity and expertise of the Fisheries Division (Inland) by providing day-to-day operational guidance and on-the-job training to Fisheries personnel. Persons selected for training will be from personnel assigned to the Fisheries Division and the Jamaica School of Agriculture.

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Production aspects of the project will involve extension work and close coordination with the government sponsored Operation G.R.O.W. project, the Jamaica Industrial Development Corporation (J.I.D.C.) and individual farmers/producers. The Fisheries Division (Inland) will initiate existing pond surveys and extension efforts to small farmers/producers with the assistance of four Peace Corps Volunteers.

The marketing and distribution of fish will be undertaken, in part, by the J.I.D.C. and the Agricultural Marketing Corporation (A.M.C.). The A.M.C.'s distribution network includes a series of 35 special Shops and 26 Mobile Units which are directed to Jamaica's poorer majority. Additional marketing will be through less formal, non-institutionalized channels such as local farmers' markets and higglers.

3. Purpose

The purpose of the project is to create within the Government of Jamaica Fisheries Division the institutional capability and technical expertise to design and implement an inland fisheries program. Its success is dependent upon the identification and acceptance of qualified personnel to participate in the proposed training.

4. End of Project Status

a) A trained inland fisheries section within the Fisheries Division by the end of 1978; b) an efficient and improved Twickenham Park Fisheries Station; c) an applied research capability within the Fisheries Division; d) an increase in fish yields to 4,000 pounds per acre annually for small producers and up to 8-10,000 pounds per acre annually at Morelands Food Farm; and e) establishment of an accurate records division within the Fisheries Division (Inland).

C. Summary Findings

The value of an intensive fish culture project in Jamaica lies in its ability to provide increasing amounts of fish to consumers at a competitive price and yield a profit to the producer.

The projected inland fisheries production from new ponds is expected to be 112,000 pounds in 1976 and 820,000 pounds by the end of the project in 1978. Within five years fish produced from intensively cultivated ponds is expected to reach one million pounds annually and at a decreasing cost of production.

A small producer raising fish on an intensive basis in a one-acre pond is projected to make an annual profit of \$426. An intensive fish culture project is not labor intensive and the project is not expected to have an appreciable effect upon rural employment.

The internal rate of return of the project is projected to be 29 percent.

D. Project Issues

A number of issues were raised in the DAEC review of March 14, 1975 (see Annex G for DAEC review cable) and in joint discussions between the GOJ and USAID. The major issues include:

1. Who are the expected beneficiaries of the project? The lower economic group constitutes approximately 70 percent (1,400,000) of the Jamaican population. For this group the most important sources of energy are sugar (locally produced) and wheat flour and rice (imported). Their protein foods are salt fish, flour and rice (all imported) and locally produced corn. In the rural areas 78 percent (144,604) of the farms are less than five acres in size and account for 15 percent (223,818 acres) of the total farm acreage. Additionally, 83 percent of the farmers accounted for less than 25 percent of total income from agriculture in 1962.

The primary benefits from the further development of the inland fisheries sector are expected to be increased amounts of fish available to Jamaica's poorer majority at lower prices. Aquaculture production can be a profitable undertaking to the small producer but the production system is not expected to have an appreciable impact upon rural employment.

2. What is the existing benchmark data that can be used to evaluate the project's performance? The stocking of naturally existing farm ponds was initiated in 1953. Various documents indicate that up to 900 ponds now exist covering up to a total surface area of 3500 acres. There is, however, a wide variation in the pond and surface area figures. The Fisheries Division estimates that approximately 250 ponds are stocked and harvested with some degree of regularity. However, the Fisheries Division also stated that 20,000 fingerlings were stocked by them in 1974 at a stocking rate of 1,000 to 1,250 per acre. At best only 20 acres of farm ponds were stocked in 1974.

Additionally, inland fisheries production was estimated to be five million pounds in 1974. This figure does not include any fish taken from streams, canals or rivers but only that from farm pond sources. This production figure is at variance with the number of ponds stocked.

This reflects the paucity of data available on inland fisheries production in Jamaica and the need for the GOJ and USAID to develop an improved data base. A portion of the proposed project involves the surveying of existing farm ponds jointly by the Fisheries Division and Peace Corps Volunteers. Methods will be developed to collect production data from fish producers.

3. What is the distribution and marketing system for fish? The present fisheries catch is distributed through local fish vendors, the A.M.C. and other market distributors. The demand for fresh fish exceeds the supply and as a consequence a fish processing industry has not developed.

The Morelands Food Farm is establishing a pilot fish farm in addition to producing vegetables and rice. A food processing line will be constructed to process the fish and vegetables. The production will be distributed through the A.M.C.'s network of market outlets. At the J.I.D.C. site, an abattoir will be constructed for the processing of meat products and it is intended to utilize this facility for fish processing also. It is also anticipated that alternative methods of fish processing will be stimulated, which will create new opportunities for distribution of fish to rural consumers.

The initial inland fisheries extension efforts will be in the area surrounding the Food Farm and J.I.D.C. fish production ponds so that farmers/producers can take advantage of their processing facilities.

4. What is the relationship between USAID's and IDB's proposed projects in inland fisheries? On September 11, 1975, the IDB scheduled a review of a prefeasibility study of a fishery development project in Jamaica encompassing both inland and marine fisheries. The inland fisheries aspect of the IDB prefeasibility study includes a survey of inland water bodies suitable for extensive fish culture and a survey of sites with potential for the development of intensive fish culture ponds. IDB will also study the marketing, distribution, and storage aspects of the marine and fresh fish sub-sector in Jamaica. Upon receipt of this proposal AID advised IDB of its possible involvement in a Jamaican inland fisheries project. If the IDB prefeasibility project is approved it is felt that the USAID project, which will upgrade the research and technical capabilities of the Fisheries Division, will be complementary to any inland fisheries project the IDB may consider appropriate to finance.

5. What role can the U.W.I. play in inland fisheries development? It is envisioned that the Jamaica School of Agriculture will participate in this project by developing a fisheries curriculum for an optional third year program in the JSA. As Jamaica's major agricultural school, the JSA's focus on a practical curriculum is more suitable to development of a fisheries program than that of the U.W.I.

6. What is the role of women in the production, processing and marketing of fish? Women are involved in the fish industry principally as higglers (distributors) in the rural areas. As the project develops, it is expected that women will benefit through increased supplies of fish available for distribution at a lower price.

II. Project Background and Detailed Description

A. Background

There is excellent potential in Jamaica for commercial inland water fish production through intensive fish farming. Fish are recognized as a staple in the Jamaican diet; however, the people of Jamaica have a low consumption of fish due to limited supplies and high prices. A fish farming program not only will offer increased supplies of badly needed, high quality protein at lower prices but will also increase profits to producers, thereby providing incentives for greater production.

The possibility of developing an inland fish culture in Jamaica dates to 1949 when a British fisheries expert suggested the introduction of the African Chichlid Tilapia mossambica to the island. The then just established Fisheries Division followed this advice, introduced the fish from the island of St. Lucia and in 1950 built an experimental fish culture station at Twickenham Park.

Over the past 20 years, the Fisheries Division claims to have stocked some 700 ponds in Jamaica, covering an area of between 500 and 1000 acres. No exact measurements exist. None of the ponds have adequate drainage systems which makes harvesting difficult. The practice normally used is for the Assistant Fisheries Officer and field assistants to harvest the crop by seining when the majority of fish have reached harvestable size. Since little or no fertilization is used, the presence of aquatic vegetation makes harvesting difficult. When harvesting has been completed, the ponds are restocked and another crop is produced. The Fisheries Division estimates that at present between 100 and 200 pounds per acre are realized. With proper fertilization and feeding methods the intensive cultivation of fish should produce 4,000 pounds per acre annually. The use of more intensive fish culture practices can result in 10,000 pounds of fish per acre annually.

The GOJ has established a food and nutrition policy which has, as one of its objectives, to reduce by 20 percent the proportion of energy and protein supplied from imported foods by 1980. The Fisheries Division has a responsible role to play in attaining this import reduction as well as increasing the per capita availability of fish. Fresh fish are presently (September 1975) being sold at \$U.S. .90 - \$U.S. 1.10 per pound. The project expects to produce fish at \$U.S. .40 per pound.

Imports of fish (fresh, frozen, canned, and salted) in 1974 totaled approximately 35 million pounds. A 20 percent reduction of imported fish would require an increase of 7 million pounds of fish by Jamaican fishermen and producers. Present annual fish production in Jamaica is estimated at 38 million pounds from the following sources:

off-shore fishing	22 million pounds	58%
deep-sea fishing	10	26%
fresh water fishing	5	13%
sport fishing	1	3%

Since fresh water fishing accounts for 13 percent of total local fish production an additional 910,000 pounds would be required to meet the goal of reducing imports. Additionally, the aggregate demand for fish is expected to increase by 14 percent by 1980 over present consumption which would account for an additional 133,000 pounds of fish to be provided through the inland fisheries sector. By 1980 a total increase of 1,043,000 pounds of fresh water fish is needed to meet stated goals.

However, there is concern about the validity of the baseline figure of 5 million pounds. It is probable that fresh water fish production is lower. Hence, the production from new ponds managed by intensive cultivation methods can be evaluated against the million pound increase in the absence of better data.

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The Jamaican government has assigned a high priority to the development of a program in fish farming. In order to succeed in this program, the existing infrastructure must be strengthened to overcome current shortcomings; i.e. the government's presently limited capacity to provide adequate numbers of fish fingerlings with which to stock commercial ponds, the short supply of technical personnel required for successful demonstration and extension projects in fish farming and for training and monitoring farmers in their efforts at fish farming. To initiate positive action to overcome the shortcomings the proposed grant gives high priority in the development of the 1) increased technical competence of the Jamaican staff, 2) adequate laboratory and field facilities for demonstrating food-fish farming operations to producers, and 3) an expanded fish fingerling production program.

The implementing organization for Jamaica will be the Fisheries Division (Inland) of the Ministry of Agriculture. A brief description of the present status of the Division is presented with the increased staff elements needed for the fish culture project.

Fisheries Division, Ministry of Agriculture

The Fisheries Division is small, particularly in regards to its efforts in inland fisheries and fish culture. The professional staff consists of one Fisheries Officer who administers the overall program, which is heavily oriented toward the marine component, plus three assistant fisheries officers assigned to inland fisheries. Of the latter, one is assigned to work in inland fisheries extension, another has administrative duties. A third position has recently been filled and this person will act as the GOJ counterpart to the AID-funded

technician, In addition to the professional staff, who have Bachelor of Science degrees, there are one fisheries extension instructor and nine pond operators and laborers. This total of 13.5 persons assumes the Fisheries Officer divide his time equally between the marine and inland fisheries program.

Three biologists will be required to supervise and direct programs as they are developed for; 1) the Twickenham Park Fisheries Station, 2) the country-wide fish culture extension program, and 3) as a counterpart to the USAID resident fisheries advisor, who will be closely involved in the planning and implementation of all of the sub-projects which will comprise the fish culture development program. The Fisheries Division will provide qualified persons to serve as counterparts for each of the four Peace Corps Volunteers who will be associated with the fish culture project. These persons will continue as inland fisheries extension agents after complete implementation of the project.

The personnel pattern outlined above represents a minimal staffing requirement for successful implementation of a significant fish culture program in Jamaica. It is quite likely that this staffing pattern will have to be increased further as programs become established and undergo expansion.

The Physical Plant

The present lack of adequate field facilities for fish fingerling production as well as demonstration areas for applying improved fish pond production methodology constitute major constraints in developing a viable fish culture program. A detailed description is given of the country's only fisheries station with the improvements that will have to be made to convert this facility into an adequate, efficient fish production unit.

Twickenham Park Fisheries Station

This station is owned by the GOJ and operated by the Fisheries Division. It is approximately 20 years old and presently is the only government facility where fresh water fish culture can be carried out. It is reported that in 1974 a total of 5,000 male African Perch fingerlings were produced for stocking local ponds. At present stocking rates this is adequate to stock approximately five acres of ponds. Additional fingerlings for distribution are obtained from private farm ponds. There are six ponds at the station comprising a surface area of 1.8 acres. An additional land area of about three to four acres and contiguous with the existing pond complex is available for further pond construction.

Building on the fisheries station include an abandoned laboratory type building and two small dwellings that are occupied by laborers working at the station. The field laboratory will be placed in operating condition at a cost of \$U.S.38,000. Although the basic masonry structure is in sound condition, it will require an entirely new roof, windows, doors and complete interior remodeling, including installation of new electrical lines and repair or replacement of the plumbing system.

In addition, a house will be constructed for the GOJ resident manager of Twickenham Park at a cost of \$U.S. 16,500.

Practical Application

Field facilities needed to demonstrate practical fish farming technology will be provided directly through the Food Farm Program and the production and processing program proposed by the Jamaica Industrial Development Corporation in connection with its new abattoir.

Food Farm Program

Under Operation G.R.O.W. (Grow and Reap Our Wealth), an agrarian reform program actively is being carried out by the Ministry of Agriculture in which lands suitable for agriculture but presently underdeveloped or underutilized are placed into more intensive production. The underutilized lands are either purchased outright or leased from the land owners on a long-term basis and subsequently parceled out to small farmers.

There are two major ways in which the agrarian reform program functions: 1) Land Lease Program: Lands acquisitioned through government lease are subleased to small farm operators, and 2) Food Farm Program: Land acquisitioned or already owned by the government is farmed by the government for production of agricultural commodities that are in strong demand and short supply.

At the present time the Food Farm Program in particular lends itself very well to pond and fish culture development. For operations of this type a general farming plan is first developed in which suitability of land and specific crop requirements are carefully matched. Emphasis is placed upon multiple land use practices in which good soil and water conservation and management can be practiced. Ground and surface water supplies exist in abundance during the wet season, but these water sources normally are in critical short supply during the latter part of the prolonged dry season. Hence, the Food Farm Program with its emphasis on wise management of Jamaica's land and water resources is most important.

Food Farm programs are being carried out at present in many different areas of the country. At the Food Farm's Morelands Project several hundred acres of previously undeveloped land are being developed primarily for production of rice, fish, and vegetables.

The food fish production unit of Moreland's Food Farm will initially consist of approximately 14 production ponds of two acres each with plans for future expansion to 45 acres. With an excellent pond design provided by the Fisheries Division, construction of the first 14 ponds started in May and is scheduled for completion in October 1975.

There is almost an unlimited opportunity for a good tie-in of fish culture projects with the Food Farm Program in Jamaica. Such fish production units, in addition to supplying badly needed supplies of high quality protein, could serve very effectively as demonstration centers for training and extension programs in aquaculture as well as the more traditional agricultural crops.

Agricultural Marketing Corporation

The A.M.C. was established in 1963 to provide and maintain marketing outlets for locally produced agricultural produce. This was to be accomplished by buying the agricultural production of Jamaican farmers. Additionally, the A.M.C. provides for the collection, transportation, storage, grading, packaging, and processing of agricultural commodities. The A.M.C. follows a policy paying the farmer a price for his production which may not fall below a level which covers the cost of production plus a profit margin of not less than 20 percent.

In 1964 the A.M.C. purchased and sold 3,000 tons of agricultural commodities. By 1974 the amount purchased had increased to 30,000 tons and by 1977 the A.M.C. plans to purchase 90,000 tons. In order to facilitate these purchases the A.M.C. has 150 buying stations throughout Jamaica.

The A.M.C. has a variety of distribution outlets. There are 16 major retail outlets located in urban areas. There are 35 Special Shops serving lower-income urban wage earners. There are also 26 Mobile Units which travel in rural areas. The Special Shops and Mobile Units sell the produce at 20 percent below the normal selling price to lower-income wage earners.

The A.M.C. works closely with the Food Farm program and purchases much of its production. Additionally, the A.M.C. purchases fish from local fishermen and will purchase fish produced from inland ponds.

Jamaica Industrial Development Corporation

This corporation is in process of completing detailed plans for construction of an abattoir which initially is to be financed by a loan from the World Bank. The plant, which is to be designed to permit expansion, initially will have capacity to slaughter and process during an eight-hour day a total of 100 head of cattle, 150 hogs, and 50 sheep or goats. The corporation is interested in developing a fish farm in conjunction with the abattoir in order to utilize effectively processed offal as fish food and the enriched waste water effluent from the abattoir, after appropriate biological purification, for fish production.

Location of the plant will be approximately 17 miles west of Kingston in Amity Hall on a 59 acre plot of land made available to the project by GOJ's Agriculture Development Corporation. Since only a portion of the land area available to the project will be required for the abattoir and livestock holding pens, the balance of the project land is available for fish pond production units. A fish processing unit will be consolidated into the plant design which not only will accommodate fish crops from the plant's fish production units but from small producers' ponds also.

Technical Assistance Component

Due to the limited involvement in inland fisheries programs by the Fisheries Division, staff development in this area has been minimal. At present there are three biologists, Assistant Fisheries Officers, devoting an effort to inland fisheries. These are relatively young men with B.S. degrees in biology, but they have had no formal training in aquaculture. It is imperative to the success of the fish culture project that an adequate technical assistance component be included.

The project proposes that a resident advisor be provided for the entire three-year period of the project. The fisheries advisor should have a graduate degree and field experience in the practical or applied aspects of fish culture as well as a substantial appreciation of economics as related to fish farming. With appropriate Fisheries Division counterparts, the advisor will develop the strategy for the government's fish culture program and actively participate in its implementation. He will assist in coordinating the various project components and integrate them in a way that will be most likely to result in maximum impact to the country and the small farmer.

The resident advisor also will serve as the principal liaison between the USAID and the Fisheries Division and provide backstopping to the AID Mission on the technical aspects of the project. He will coordinate the in-country training program so that a qualified and competent staff may be developed to continue the fish culture project in an effective way at the conclusion of the three-year grant.

In addition to the resident fisheries advisor, there is need to include consultants who may participate in short-term assignments in various specialty fields such as pond design, pond construction, hatchery management, fish nutrition, fish diseases, and fish economics and marketing. These specialists very likely will be need to solve specific problems as they are encountered and also for the purpose of conducting short training courses in-country. Three man-months of short-term consulting services are to be provided on an annual basis.

In view of the present lack of trained aquaculture personnel in the Fisheries Division and the extended time period that will be required to train such workers for high level performance, the project proposes to utilize four Peace Corps volunteers in the fish culture project. Three volunteers, with appropriate counterparts, will carry out a survey of the existing ponds in the parishes surrounding the Morelands Food Farm project, the J.I.D.C. production ponds, and the Twickenham Park Fisheries station. One other volunteer will be assigned to the Twickenham Park Fisheries station. The Peace Corps has agreed to participate in the project.

The pond survey will provide information on pond size, location, ownership, accessibility, work quality and availability, condition of bottom, possibility of multipurpose use of water, and renovation required to place pond in condition for intensive fish culture. This survey will enable the Fisheries Division to design a rational plan for fish culture development. This will be the first step in devising an extension program in inland fisheries to reach small producers.

The Twickenham Park Fisheries station, the J.I.D.C. project and Morelands Food Farm are all located within 30 miles of each other (see Annex C for map). It is planned to initiate the inland fisheries extension effort in the surrounding parishes to take advantage of the proximity of the processing and marketing facilities of the two large scale facilities. Additionally, the Fisheries Division reports that 175 farmers have farm ponds that have been stocked with Tilapia mossambica in the adjacent parishes (Manchester, Clarendon, St. Catherine, and St. Andrew). These are logical persons to contact initially with regard to the intensive fish cultivation extension program. Furthermore, it is felt that limiting the scope of the project to this southcentral region will allow a more effective concentration of project resources.

Training Component

Of the various components included within the project, training is one of the most important. The training of a sufficient number of host country personnel at an adequate level will increase the opportunity for a successful project and, in addition, will make possible the achievement of a greater impact over a much longer time period. It will also be necessary to establish a linkage with an existing institution in Jamaica whereby training in practical fish culture will be available to other young people after the project is completed.

The Jamaica School of Agriculture (J.S.A.) is located next to the Twickenham Park Fisheries station. The school currently offers a two-year agriculture curriculum and has about 600 students. Current J.S.A. plans are to add an optional third year to the curriculum to allow students to specialize in one field of agriculture. The project proposes to provide assistance to develop a fisheries curriculum for the third year. One staff member will be given advanced training in aquaculture production. A series of ponds will be built for students to use as field laboratories. Students will be able to use the facilities of the fisheries station.

The project includes the following training:

1. Three long-term participant training positions, each two years in duration to provide recipients with the opportunity to earn Master of Science degrees at American institutions offering curriculums in aquaculture and closely allied disciplines. These persons will be responsible for the continuation of the inland fisheries program upon their return. Moreover, they will be able to assist with any projects proposed by the IDB.
2. Twelve man-months equivalent of short term, special study tours to the U.S. and third country fish culture projects and educational institutions. Specific attention should be given to technological packages which have already been formulated for implementation in fish farmer extension programs. Various third country culture systems with fish species similar to those which occur in Jamaica may be transferred directly and thus avoid expensive duplication in experimental programs and field trials. Study tours to various commercial fish farming operations in southern United States would be valuable for selected staff of the Fisheries Division and the Extension Service. This would allow these staff members to observe the methodology utilized in the production, harvesting, processing and marketing of fish crops.
3. Short-term training sessions will be held in-country at appropriate periods for the purpose of providing an improved base of fish culture knowledge for those field staff who will be directly involved in the country's fish culture development program. Such sessions will be carried out in conjunction with the aforementioned short term advisory services.

Commodity Component

Implementation of the fish culture development program will necessitate logistical support. Much of the equipment and supplies commonly used in fish culture is very specialized and available only in countries where fish farming is an established industry. Hence, most of the laboratory field equipment will have to be imported. It will also be necessary to purchase vehicles for use in the extension component of the project. A commodity list is included as Annex B.

B. Detailed Description (Logical Framework included as Annex D)

The Sector Goal

The goal of this project is to assist in meeting GOJ's food and nutrition objectives by increasing the production of inland fish by 1,043,000 pounds by 1980. The end of project target in 1978 would be 820,000 pounds. Rationale for this goal is discussed in Part II.A. Background.

The Project Purpose

The project purpose is to create within the GOJ Fisheries Division the institutional capability and technical expertise to design and implement an inland fisheries program involving applied research, experimentation, and an inland fisheries extension program.

Conditions Expected at End of Project

(a) A trained inland fisheries section within the Fisheries Division by the end of 1978. The present complement of the Fisheries Division (Inland) consists of 13.5 fisheries professionals, technical persons and laborers. By 1978 this number should be increased to at least 21.5 trained persons.

(b) An efficient and improved Twickenham Park Fisheries Station including a modernized laboratory and upgraded fish storage facilities. Addition of five acres of ponds to the ponds now at the Station and five acres of ponds on the adjacent J.S.A. grounds.

(c) Applied research capability within the Fisheries Division covering experimentation with feeds, fertilizer and fish technology; availability of applied research results to producers as well as responding to the needs of producers in solving production problems.

(d) An increase from the 100-200 pounds of fresh water fish per acre realized at present on an extensive cultivation basis to at least 4,000 pounds per acre on an intensive basis by smaller producers with up to 8-10,000 pounds per acre annually by the Morelands Food Farm and J.I.D.C. projects.

(e) The establishment of adequate and accurate records and statistics within the Fisheries Division pertaining to inland fish production.

The Planned Outputs

Outputs

Output Indicators/Target Dates

(a) Personnel trained in inland fisheries development.

Three persons should have completed advanced academic aquaculture training in the U.S. by 1978; about six persons should have completed short term training in the U.S. or third country by mid-1978.

(b) Survey of inland fisheries development potential completed.

Under the direction of a resident U.S. fisheries specialist, a survey of 175 existing private farmers in southcentral Jamaica who have managed their ponds on an extensive basis.

(c) Extension program in operation.

Extension of intensive fish culture management methods to 40 farmers with fish ponds currently managed on an extensive basis and to 25 farmers with no prior fish culture experience.

(d) Upgrading of the Twickenham Park Fisheries Station.

Completion of improvements to the physical plant of the Station including modernization of the laboratory by August 1976; improvements of the existing ponds by June 1976; construction of five acres of additional ponds by March 1977; construction of five acres of ponds at J.S.A. by March 1978.

Project Inputs

1. Proposed Inputs by the U.S. - \$U.S. 355,000

a) The services of one aquaculture specialist, for a three-year period beginning in early 1976. This specialist will be responsible for overall project management and the coordination of the initial inland fisheries survey, the applied research program, the inland fisheries statistics methodology, and the extension program (36 MM)

b) Short-term consultant and training services. (9 MM)

c) Participant training grants for long- and short-term training. (72 MM for long-term and 12 MM for short-term)

d) Commodities consisting of laboratory equipment, educational materials and vehicles.

2. Proposed Inputs by the GOJ - \$U.S. 622,000

a) The renovation of Twickenham Park Fisheries Lab and ponds and new construction of fish storage area, residence, and ponds.

b) Salaries for an increased (from 13.5 to 21.5 persons) fisheries division (inland) staff.

c) Administrative and operating support.

III. Project Analysis

A. Technical Analysis

In developing this project with the Jamaican Fisheries Division the Mission has utilized short term technical services of the staff of Auburn University's Department of Fisheries and Allied Aquaculture. The University is the major U.S. institution in the field of inland and warm water aquaculture. AID has assisted in the development of an international dimension to Auburn's work through a 211(d) grant (extended in June 1975 for an additional two years) and various mission and centrally funded contracts. Therefore, the Mission feels that the technical assistance provided by Auburn reflects the best of what is known about intensive fish culture and is appropriate to Jamaica's needs and capabilities.

Dr. E.E. Prather carried out a preliminary survey of Jamaica's fish culture potential in June 1974. On the basis of his recommendations and the interests of the Fisheries Division a PROP was submitted in February 1975. A more detailed technical analysis of the project was carried out by Dr. D.D. Moss in August 1975. His assistance as requested to make final project recommendations and to evaluate new developments in aquaculture in Jamaica during the past few months, i.e., the Morelands Food Farm and J.I.D.C. fish culture activities.

Basic to the success of an aquaculture project is the quality of the soil and water. Sufficient water of good quality and soil with sufficient clay to hold the water are present at Twickenham Park, the J.I.D.C. site, and at Morelands Food Farm. Pond sites for small producers will be evaluated individually by the inland fisheries extension agents.

Tilapia mossambica is currently being stocked and raised in Jamaica's inland ponds. Since this fish is known to producers and Fisheries Division personnel it is expected to continue with it during the initial development of this project. During the project's second year work will commence on the Tilapia hybrid, which produces 100 percent males, at the Twickenham Park Fisheries station. This will be applied research rather than basic research and will take advantage of the knowledge learned at the Pentecoste Aquaculture Research Facility in northeastern Brazil. The Tilapia does have known culture potential and grows well in tropical inland waters. Additionally, it is a fish which is currently raised for domestic consumption in Jamaica.

Environmentally, the intensive cultivation of fish in ponds will not have a deleterious effect. Fish wastes assist in keeping a pond fertile, a necessary condition for intensive fish culture. If a pond is drained for harvesting the run-off water and waste can help fertilize

a lower level pond or agricultural land. Developing a network of ponds in an area can have a positive influence upon the environment through effective watershed management thereby lessening the effect of soil erosion.

B. Financial Analysis and Plan

The inland fisheries project is expected to cost \$977,000. The GOJ will finance \$622,000 of the project's costs through the Fisheries Division. The balance of \$355,000 is proposed to be financed through an AID grant. The GOJ share of the project has been discussed with officials of the Fisheries Division, the Ministry of Agriculture, and the National Planning Agency. Approximately one-half of the GOJ share of the project costs is in addition to its current annual expense.

The Financial Plan by Input is presented as Table 1. Project Cost by Output is presented as Table 2. The in-kind contribution of GOJ is \$22,000 and is the estimated value of the Twickenham Park Fisheries station (land and buildings). A major proportion of the GOJ budget (\$133,000) is for renovation and new construction at the fisheries station. This is considered to be an essential first step for the establishment of a successful inland fisheries project. Contingency costs of 15 percent have been included in the budget and the GOJ budget incorporates an annual eight percent increase to personnel salaries.

The GOJ budget share has been approved through normal budgetary processes. The proposed increased expenditure by the GOJ provides for additional personnel; reactivates the fisheries station; and increases the inland fisheries extension unit.

Table 1 . Financial Plan by Input

<u>USE</u>	(US \$000)		<u>TOTAL</u>
	<u>AID (FX)</u>	(SOURCE) <u>GOJ (LC)</u>	
Technical Assistance			
Long Term	150		150
Short Term	18		18
Participant Training	81		81
Commodities			
Equipment	30		30
Vehicles	30		30
Capital Contribution			
Existing facilities		22	22
Renovation of facilities		50	50
New facilities		83	83
Salaries		281	281
Administrative		105	105
Contingency - 15%	46	81	127
TOTAL	355	622	977

Table 2 . Project Cost by Output
(US \$000)

<u>OUTPUTS</u>	<u>Financial Input</u>		
	<u>AID</u>	<u>GOJ</u>	<u>TOTAL</u>
Trained Personnel	149	96	245
Survey-Extension	30	135	165
Upgrade Fisheries Station	50	165	215
Research Program	80	145	225
Contingency - 15%	<u>46</u>	<u>81</u>	<u>127</u>
TOTAL	355	622	977

C. Social Analysis

Jamaica's recorded history began in 1494 with Columbus' discovery of the island. It became a pirates' haven in the 1600s. Jamaica's plantation economy commenced in the 1700s with the introduction of slaves and sugar cane. The best lands of the mountainous island were utilized for export plantation crops. After the emancipation of the slaves in the mid-1800s the former slaves acquired small plots of marginal lands peripheral to the major plantations.

Currently 80 percent of all farms are less than five acres in size and cover 15 percent of the arable land. Moreover, 98 percent of all farms are less than 25 acres in size and account for 37 percent of the arable land.

The Ministry of Agriculture has identified the major constraints to increasing agriculture production in Jamaica as the many small and inefficient farms on marginal land; the over-intensive cultivation and misuse of steep-slopes; and the under-production of domestic food crops. The proposed project addresses these impediments - fish ponds can be constructed on marginal land and a series of ponds in a region is a good watershed management practice. The resultant fish production is to be consumed domestically. The project is not expected to compete with other agricultural crops. Moreover, the Ministry of Agriculture estimates that there are 60,000 acres of under-utilized land on farms of under 10 acres. Is is this land on which now ponds will be established or existing ponds renovated.

The project intensifies the inland fisheries system that is now in existence: extension, production, and distribution. No new organizational elements are being proposed although it is expected to increase the staff of the Fisheries Division (Inland). The project is not expected to be socially disruptive since fish are part of the Jamaicans' diet and at least 250 producers are engaged in extensive fish culture production. The day-to-day maintenance of a fish pond requires minimal time.

Throughout the economic analysis of the project a pond construction cost of \$3212 per acre was used. This is the cost of the fourteen 2 acre ponds under construction at the Morelands Food Farm with seven bulldozers. The initial construction cost is excessive for an individual farmer. It is expected that small producers will utilize natural land depressions for their ponds and only a minimal amount of hand labor will be required to renovate existing or construct new ponds.

The stocking of farm fish ponds has been practiced in Jamaica since the early 1950s. Even though this process has been on-going for 25 years there is little available data on inland fisheries production. A survey of existing fish ponds will be undertaken during the course of the project. The resultant information will assist in quantifying the effects of the project.

Three types of spread effects are envisaged for the project: producers, both with and without previous fish culture experience; Food Farms; and increased consumption.

The pond survey will be the initial step in the extension of intensive fish culture practices. The survey teams will identify those producers with interest in increasing pond productivity and in initiating a fish culture production system. The Morelands Food Farm is initiating a pilot fish production system. If successful, the Morelands' production ponds will be increased from 28 to 45 acres. Additionally, the Director of the Food Farms plans to extend fish production to the eight other existing Food Farms.

The major spread effect of the project is to increase the consumption of fish among lower income Jamaicans. An efficient fish production and distribution system will make available fish at lower prices than those now paid for imported processed fish. Since fish are part of the Jamaican diet no problems of consumer acceptability are expected.

Consistent with the spread effects, the project is also designed to help the following groups: lower income consumers, producers, and the higglers (distributors). As stated, the rationale for the project is to make fish available to lower income consumers at lower prices. The economic analysis shows that a one acre pond of intensively cultivated fish can yield a \$426 annual profit. The per capita annual income to an agricultural laborer is \$500 whereas the per capita annual income to the total labor force is \$1700. A well managed pond can yield profits that can have a positive impact upon a producer and his family.

Higglers are an integral part of the distribution system for locally produced food stuffs in Jamaica. Higglers are women who originally sold food produced on their farms. These women still sell their own produce but the system has evolved to a point where the women are middlepersons in the food distribution system. For example, higglers meet the fishing boats as they come into port and directly purchase part of the catch for subsequent resale.

The project has been deliberately designed to focus available resources in southcentral Jamaica to take advantage of existing roads and proposed processing centers.

D. Economic Analysis

The Economic Rate of Return of the proposed project is presented as Annex A, Table 3. The projected internal rate of return is 29 percent over the period 1976-1985. This is above the AID-recommended figure of 15 percent. The incremental net benefit of the project is expected to be negative in the first two years but will be positive thereafter.

The Project Costs are the combined costs of AID and the GOJ while the Post-Project Costs reflects the enlarged staff and functions of the Fisheries Division. The Producers Costs reflect the various fixed and variable costs that producers will incur at projected production levels. (Annex A, Tables 5 and 6 show a detailed breakdown of these costs for a small producer with a one acre pond and for the Morelands Food Farm.)

Factor input prices are valued at current Jamaican prices. No data is available in Jamaica regarding the man-hours required for intensive fish culture production. Therefore, use was made of labor data from the El Salvador inland fisheries project. The source of this data was E.W. McCoy, "Economic Analysis of the Inland Fisheries Project in El Salvador" and W.T. Wilford, "Fisheries Project Report". Labor data was adjusted to reflect differing labor requirements for various projected yields. Feed and fertilizer requirements were also adjusted to relate to various projected yields.

Total costs were reduced by the Cost without Project. This amount is the cost to operate the Fisheries Division (Inland) at current staffing levels.

Pond yields are an aggregate of various intensive fish culture production units as shown in Annex A Table 4. The Yield without Project assumes 250 one acre ponds with an annual yield of 200 pounds. The value of production at .55¢ per pound is the value of the fish after harvest but before processing and marketing. Essentially it is the value of the fish at the bank of the pond and includes a 20 percent profit to the producer. The Incremental Net Benefit is the projected increased value the project is expected to have on inland fisheries production.

Project Effects on Income

Annex A Table 5 presents a comparison between actual data from inland fisheries production units in Brazil and El Salvador and projected costs and benefits for Jamaica. Costs are shown in local currencies and in percentage terms for ease of comparison. The percentage return to a Jamaican producer with a one acre pond is projected to be 24 percent. This compares with 33 percent in Brazil and 8 percent in El Salvador with one hectare ponds. The Brazilian return is higher and is due, in part, because there was no loan interest to pay on pond construction costs.

Pond construction costs in Jamaica are estimated to be approximately \$U.S. 3500 per acre based on data supplied by the Morelands Food Farm. This cost reflects a capital intensive approach used to construct the 28 acres of ponds at that facility. An individual producer would likely be able to reduce this cost thereby increasing the return to a small producer in Jamaica. Even if this cost was not reduced a Jamaican producer could realize a projected annual profit of \$U.S. 426 (\$J 387) for one acre of intensive fish culture production. This compares favorably with the profit of \$US 330 (J\$ 300) per acre that a Jamaican dairy farmer can expect.

Project Effects Upon Availability of Fish Protein

Annex A Table 6 presents the Projected Costs for the Morelands Food Farm Fisheries Unit during the period 1976-1978. The Food Farm is projected to produce one pound of fish at \$US .44 (\$J .40) by the end of 1976 decreasing its cost to \$US .28 (\$J .25) by 1978. This is the price at the pond bank and does not include processing and marketing costs. A major fish product currently being purchased by lower income Jamaicans is imported salt codfish and sells for \$US 1.65 per pound. Farmers currently raising fish in farm ponds are selling them fresh for approximately \$US .90 per pound.

The marketing of the fish will be through the A.M.C.'s Special Shops and Mobile Units which are directed to the lower income Jamaican. If it is assumed that processing and marketing costs will double the price to the consumer, this price (i.e., \$US .88 in 1976 and \$US .56 in 1978) will still be lower than the present prices.

Project Effects Upon Employment

An intensive fish culture project is not labor intensive. Wilford has documented this fact in his analysis of the El Salvadorian experience. The fish does most of the work. During the growth period of a fish the only work required is a daily feeding which can be measured in minutes. A peak labor requirement would come at harvest time.

The labor requirement for the incremental production of fish is shown below. These figures are exclusive of labor required for pond construction and fish processing and marketing and do not include the eight additional people to be assigned by the Fisheries Division (Inland) to carry out the project.

Labor requirements for incremental fish production

<u>Year</u>	<u>Man Year Equivalent (MYE)</u>
1976	4.2
1977	10.8
1978	22.8
1979	25.7
1980	29.1

The value of an intensive fish culture project in Jamaica lies in its ability to provide increasing amounts of fish to consumers at a competitive price and yield a profit to a producer. The rationale for such a project does not lie in its employment generating effects.

IV. Implementation Arrangements

A. Analysis of the Recipient's and AID's Administrative Arrangements

1. Recipient

The Jamaican organizations that will be involved in the project are established and functioning organizations. No new organizational elements are expected to be established through this project. The key organization to implement this project is the Fisheries Division (Inland). The Division will have the responsibility to develop the dual aims of the project: applied research and extension. The project has support at all levels in the Ministry of Agriculture and the Fisheries Division. Most of the key people are already employed by the Fisheries Division and three assistant fisheries officers are assigned to the project. The proposed project involves the intensification of current work through increased human and physical resources rather than the introduction of new elements. The professional staff of the Fisheries Division has a full understanding of the close relationship of applied research and extension and that the two elements depend on a flow of information in both directions.

The other major organization involved in the project is the Morelands Food Farm. Both the Fisheries Division and Food Farm program operate within the Ministry of Agriculture. The Chief Technical Officer of that Ministry will be the official coordinator between the two organizations. The Fisheries Division has assisted the Food Farm in its planning of the new ponds and will provide assistance to the Morelands project on a continuing basis. The Morelands project is especially important as a pilot intensive fish culture project and will serve as a demonstration to Ministry officials as well as other potential producers of fish.

After the pond surveys are completed, and the applied research program is underway, the Fisheries Division (Inland) can begin to focus more of its efforts on the extension aspects of the project. As previously explained, the project will focus its extension efforts on the geographic areas nearest to the research and production facilities. Peace Corps volunteers and GOJ counterparts will implement the extension effort.

2. AID

No unusual administrative role for AID is expected with this project. AID disbursements for local currency and foreign exchange will be through normal AID disbursing arrangements as appropriate.

B. Implementation Plan

The following is a chronological list of the major project events. The Project Performance Tracking System network is included as Annex E:

<u>Date</u>	<u>Action</u>	<u>Responsibility</u>	
		<u>AID</u>	<u>GOJ</u>
<u>1975</u>			
November	- PP approved.	x	
	- Plans for renovation and new construction of Twickenham Park initiated.		x
	- PIO/T prepared for technical assistance contract with U.S. institution.	x	
December	- Identify 2 participants for post-graduate training.	x	x
	- Initial stocking of Morelands Food Farm with fingerlings.		x
	- Peace Corps requests 4 volunteers.	x	
	- Pro Ag signed.	x	x
<u>1976</u>			
February	- Contract let for Twickenham Park construction.		x
March	- Contractor arrives.	x	x
	- PIO/C prepared for commodities.	x	
	- Participants (2) for training depart.		x
	- Twickenham Park construction commences.		x
April	- Develop data collection plan.	x	x
June	- Twickenham Park renovation complete.		x
	- Extension agents assigned and training starts.	x	x
	- Additional Fisheries Division personnel assigned.		x
	- Pond survey plans developed.	x	x
	- First harvest at Food Farms and restocking (thereafter stocking and harvesting on monthly basis).		x
July	- Applied research plan developed and approved.	x	x

<u>Date</u>	<u>Action</u>	<u>Responsibility</u>	
		<u>AID</u>	<u>GOJ</u>
August	- Twickenham Park new construction completed.		x
	- Commodities received.	x	
	- Pond construction plans for JIDC completed.	x	x
	- Peace Corps volunteers (4) arrive and training starts.	x	x
	- Applied research program initiated.	x	x
September	-Pond survey initiated	x	x
October	- Extension program plans initiated.	x	x
	- Construction of JIDC ponds begins.		x
November	- Project Evaluation.	x	x
December	- Plans for new research ponds initiated.	x	x
<u>1977</u>			
January	- JIDC ponds completed and stocked.		x
	- Construction commences on new research ponds at Twickenham Park (5 acres).		x
	- Pond survey completed (4 parishes).		x
	- Extension program initiated to small producers.		x
March	- Pond construction complete and ponds stocked with <u>Tilapia</u> hybrid.	x	x
June	- First harvest at JIDC and restocking (thereafter stocking and harvesting on monthly basis).		x
August	- First harvest of small producer fish ponds.		x
October	- Identify participant (1) for post-graduate training.	x	x
November	- Plans for new research ponds initiated.	x	x
	- Project Evaluation.	x	x

<u>Date</u>	<u>Action</u>	<u>Responsibility</u>	
		<u>AID</u>	<u>GOJ</u>
<u>1978</u>			
January	- Participant (1) for training departs. - Construction completed on new re- search ponds at JSA.		x x
March	- Trained participants (2) return.		x
April	- Twickenham Park research program under complete GOJ supervision. - Develop JSA training course.	x	x x
July	- Fisheries training course approved.	x	x
September	-Classes in fisheries production begin at JSA.		x
December	- Final project evaluation.	x	x

Note: Short term overseas training and short term technical assistance advisory visits to Jamaica will occur throughout the project's life. Exact dates will be determined after the AID contractor arrives.

C. Project Evaluation

In the implementation plan joint project evaluations are scheduled annually. The 1976 evaluation will provide AID and GOJ managers with an indication as to the direction and progress of the project and the need for redefining project outputs, if necessary. The 1977 evaluation will be a more formal evaluation with AID/W assistance to determine if there is any basis to continue the project beyond the original three year plan.

An important element to these two on-going project evaluations will be the availability of inland fisheries production data - both in terms of cost and benefits. The project calls for the development of a fish culture data collection system. Data collection will be part of the Morelands Food Farm fisheries unit and the J.I.D.C. project. The extension agents will collect existing pond information through their survey. As the extension of intensive fish culture practices progresses fish production data will be collected.

D. Negotiating Status

This project has been approved through the Ministry of Agriculture, and the Mission has received an official request for the project. (Annex F).

ANNEXES

- A. Economic Analysis Tables
- B. Commodity List
- C. Map
- D. Logical Framework
- E. Project Performance Tracking System Network
- F. Grantee's Request for Assistance
- G. DAEC Review Cable, State 177807, "Jamaica Inland Fisheries Development PROP", dated June 29, 1975
- H. Draft of Project Description for Project Agreement

ANNEX A

Economic Analysis Tables

Table 3*	Economic Rates of Return
Table 4	Production from New Ponds
Table 5	Comparison of Fisheries Projects
Table 6	Projected Costs for Morelands

* Tables 1 and 2 included in text of PP

ANEX A

TABLE 3. INLAND FISHERIES PROJECT - ECONOMIC RATES OF RETURN (US \$)

	1976	1977	1978	1979	1980	1981-85
<u>COSTS</u>						
Project Costs	414328	290189	271763			
Post-Project Producers' Costs	<u>49767</u>	<u>114775</u>	<u>225067</u>	<u>148364</u> <u>253193</u>	<u>148364</u> <u>290207</u>	<u>148364</u> <u>290207</u>
Total	464095	404964	496830	401557	438571	438571
Less: Cost without Project	88427	95102	101453	101453	101453	101453
Incremental Cost	375668	309862	395377	300104	337118	337118
<u>BENEFITS</u>						
Pond Yields (Lbs.)	162000	368000	870000	970000	1090000	1090000
Less: Yield without Project	50000	50000	50000	50000	50000	50000
Incremental Yield	112000	318000	820000	920000	1040000	1040000
Value: .55¢/lb.	61600	174900	451000	506000	572000	572000
Incremental Net Benefit	(314068)	(134962)	55623	205896	234882	234882

INTERNAL RATE OF RETURN 29%

ANNEX A

Table 4. Projected inland fisheries production from new ponds, 1976-1978.

<u>Source</u>	<u>Acres of Ponds</u>	<u>Yield Per Acre (lbs.)</u>	<u>Total Production (lbs.)</u>
Food Farm, Morelands			
1976	28	4,000	112,000
1977	28	6,000	168,000
1978	45	8,000	360,000
J.I.D.C.			
1976	-	-	-
1977	10	6,000	60,000
1978	20	10,000	200,000
Private Producers:			
With Previous Fishculture Experience			
1976	-	-	-
1977	20	3,000	60,000
1978	40	4,000	160,000
Without Previous Experience			
1976	-	-	-
1977	10	3,000	30,000
1978	25	4,000	100,000

Total Acreage Under Intensive
Fish Cultivation by 1978 (Est.) 130

Total Inland Fisheries Production (lbs.)

1976	-	112,000 (lbs.)
1977	-	318,000
1978	-	820,000

ANNEX A

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	1976	1977	1978	1979	1980	1981-85
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<u>BENEFITS</u>						
Pond Yields (Lbs.)	162000	368000	870000	970000	1090000	1090000
Less: Yield without Project	50000	50000	50000	50000	50000	50000
Incremental Yield Value: .55¢/lb.	112000 61600	318000 174900	820000 451000	920000 506000	1040000 572000	1040000 572000
Incremental Net Benefit	(314068)	(134962)	55623	205896	234882	234882

INTERNAL RATE OF RETURN 29%

ANNEX A

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1978	45	8,000	360,000
J.I.D.C.			
1976	-	-	-
1977	10	6,000	60,000
1978	20	10,000	200,000
Private Producers:			
With Previous Fishculture Experience			
1976	-	-	-
1977	20	3,000	60,000
1978	40	4,000	160,000
Without Previous Experience			
1976	-	-	-
1977	10	3,000	30,000
1978	25	4,000	100,000

Total Acreage Under Intensive Fish Cultivation by 1978 (Est.)		130	
Total Inland Fisheries Production (lbs.)			
1976	-	112,000 (lbs.)	
1977	-	318,000	
1978	-	820,000	

ANNEX A

Table 5 Comparison of Percentage Cost Distribution of Fisheries
Projects: Jamaica, Brazil, and El Salvador

	<u>Jamaica</u>		<u>Brazil</u>		<u>El Salvador</u>	
	(J\$)	()	(cruzeiro)	()	(colone)	()
	(one acre)	(one hectare)	(one hectare)	(one hectare)	(one hectare)	(one hectare)
	\$	%	Cr	%	¢	%
<u>Fixed Costs</u>						
Administrative surcharge	-	-	111	1	44	2
Pond & Gear Maintenance	49	3	350	2	48	3
Amortization, Pond	161	10	1514	11	250	12
Amortization, Equipment	20	1	112	1	46	2
Land Charge	25	2	-	-	215	10
Interest	<u>579</u>	<u>36</u>	<u>-</u>	<u>-</u>	<u>450</u>	<u>22</u>
Total Fixed Costs	834	52	2087	15	1053	52
<u>Variable Costs</u>						
Feed	182	11	6417	46	344	17
Fertilizer	24	2	2340	17	14	1
Water	-	-	632	5	-	-
Fingerlings	79	5	540	4	350	17
Interest	119	7	1044	8	100	5
Operators Labor	-	-	312	2	122	6
Hired Labor	375	23	42	0	-	-
Hauling	-	-	157	1	-	-
Miscellaneous	<u>-</u>	<u>-</u>	<u>240</u>	<u>2</u>	<u>50</u>	<u>3</u>
Total Variable Costs	779	48	11759	85	980	48
Total Costs	1613	100	13847	100	2033	100
Expected Income	2000		18514		2207	
Profit	387		4668		164	
% Return	24%		33%		8%	

ANNEX A

Table 6 _ Projected Costs for Morelands Food

Farm Fisheries Unit (J\$)

	<u>1976</u>	<u>1977</u>	<u>1978</u>
Acreage	28	28	45
Yield per Acre (lbs.)	4000	6000	8000
<u>Fixed Costs</u>			
Pond & Gear Maintenance	1372	1372	2205
Amortization, Pond	4508	4508	7245
Amortization, Equipment	560	560	900
Land Charge	700	700	1125
Interest (18%)	<u>16212</u>	<u>16212</u>	<u>26055</u>
Total Fixed Costs	23352	23352	37530
<u>Variable Costs</u>			
Feed	5096	7644	16380
Fertilizer	672	1008	2160
Fingerlings	2212	3332	7110
Interest (18%)	3332	4370	7898
Labor	<u>10500</u>	<u>12292</u>	<u>18225</u>
Total Variable Costs	<u>21812</u>	<u>28646</u>	<u>51773</u>
Total Costs	45164	51998	89303
Total Production	112000	168000	360000
Minimum Price per Pound (Pond Bank)	.40	.31	.25

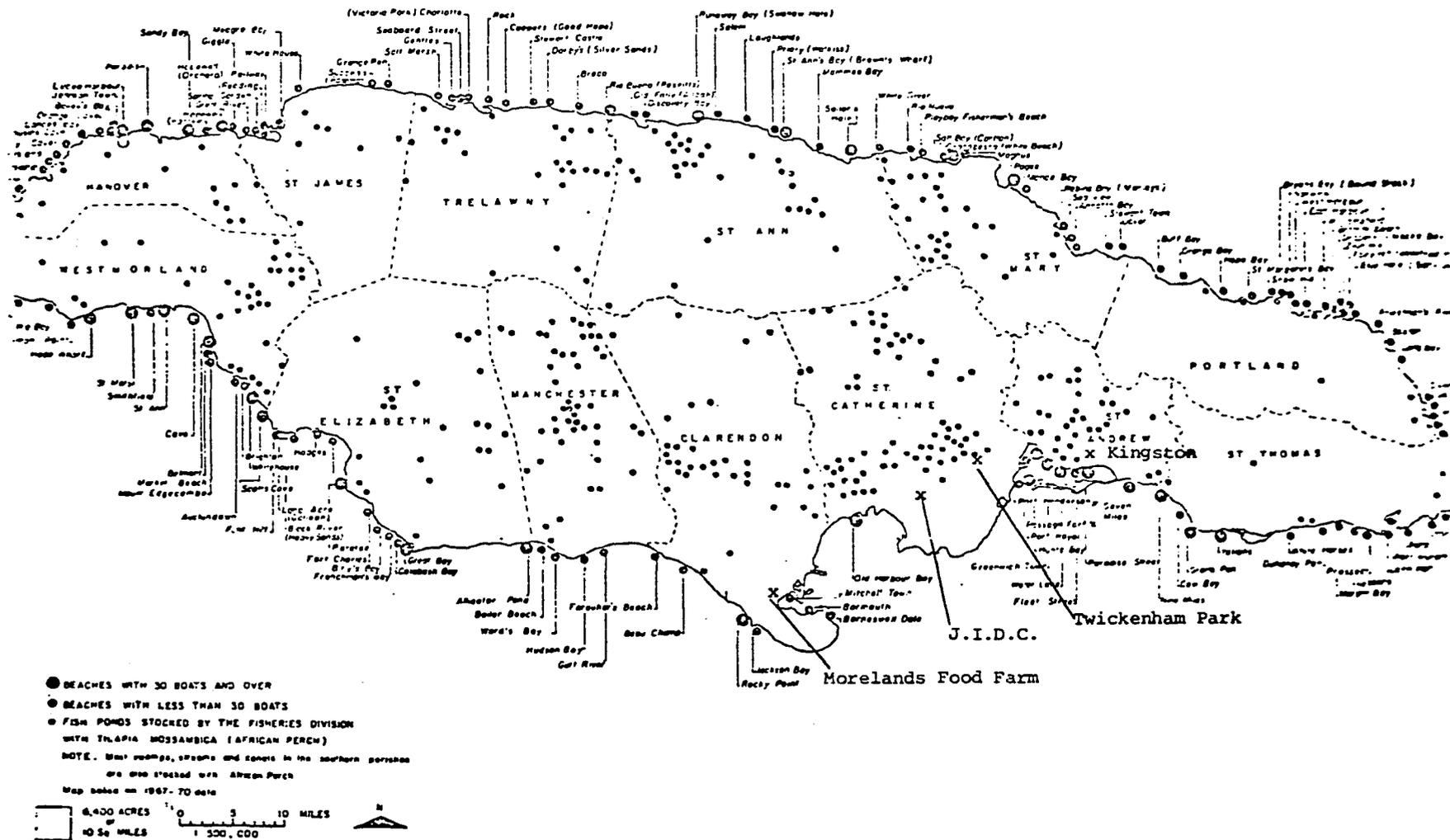
Annex B. Commodity List

<u>Quantity</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Total</u>
2	Binocular Microscope	\$ 250	\$ 500
1	Research Microscope	350	350
1	Sedgwick Paper Counter Cell	25	25
1	Whipple Ocular Micrometer	36	36
3	Microscope Slides	300	900
2	PL Meters	600	1200
1	Semi-Analytical Balance	500	500
1	Weight Sets - 0-10KG	200	200
1	Weight Sets - 0-100 KG	200	200
1	Triple Beam Balance	50	50
2	Dial Face Type Scales (0-25 KG)	75	150
2	Dial Face Type Scales (0-50 KG)	75	150
1	Platform Type Scale 500 KG	250	250
1	Water Distiller	600	600
4	DR-EL Water Analysis KTS	700	2800
12	Pocket Thermometers (CG)	4	48
12	Hand Lenses 10 x MAGN	30	360
1	Magnetic Stirrer	75	75
6	Magnetic Stirring Bars	6	36
3	Lab. Thermometers	15	45
2	Dissecting Kits & Pans	130	260
2	Augur Screw Type	35	70
5	Plankton Nets	200	1000
3	Seines	200	600
	Nets, & Other Materials		1000
12	Minnow Screen	10	120
100	Saran Screen (Yds.)	5	500
1	Calculator	650	650
1	Air Compressor 2HP	750	750
1	Water Pump	325	325
50	Emulsified Rotenon (gal.)	12	600
4	Fish Grader Boxes	75	300
6	Fish Grader Baskets	45	270
6	Agitators	45	270
2	Transport Tanks	425	850
12	Aquariums	45	540
	Accessories		150
1	Air Blower	2000	2000
24	Water Sampling Bottles	4	96
	Reference Books		3000
12	Carboursaum	5	60
1	Battery Charger	200	200
3	Refrigerator	700	2100

<u>Quantity</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Total</u>
2	Freezers	700	1400
1	Autoclave	1200	1200
1	Centrifuge	500	500
1	Water Bath	600	600
	Chemical Glassware		500
	Total Commodities		<u>\$28386</u>
2	Pick Up Truck - 3/4 Ton	6000	12000
4	Jeeps	6000	<u>24000</u>
	Total Commodities and Vehicles		<u>\$64386</u>

ANNEX C

Figure 1 Location of fish ponds in Jamaica



PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project: 1976 to FY 1978
From FY 1976 to FY 1978
Total U.S. Funding: \$155,000
Date Prepared: 12/1/75

Annex D

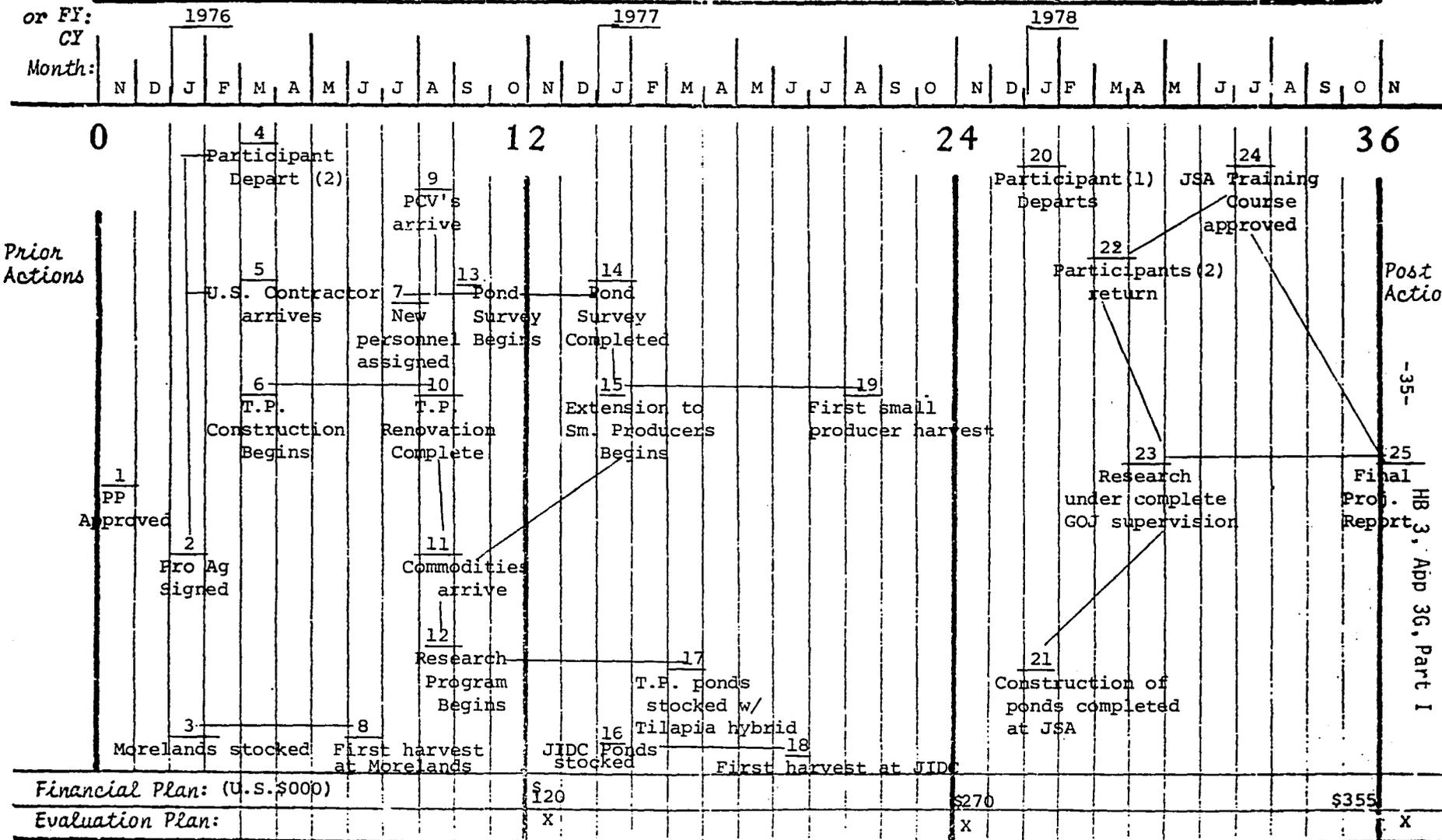
Project Title & Number: Inland Fisheries

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS																														
<p>Program or Sector Goal: The broader objective to which this project contributes: To assist in meeting the GOJ's food and nutrition objectives by increasing the production of inland fish.</p>	<p>Measures of Goal Achievement: Production of inland fish increased by 820,000 lbs. in 1978 and by 1,043,000 lbs. in 1980.</p>	<p>a) MOA and Fisheries Division records.</p>	<p>Assumptions for achieving goal targets: a) Consumption of fish in Jamaica continues at current or increasing rates. b) Distribution system operates through AMC and higglers. c) Fish distributed at lower price to low income consumers.</p>																														
<p>Project Purpose: To create within the GOJ Fisheries Division the institutional capability and technical expertise to design and implement an inland fisheries program involving applied research, experimentation and an inland fisheries extension program.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status. a) Trained staff on board in Inland Fisheries Div.; b) Applied research lab at Twickenham Park; 650,000 fingerlings produced at Twickenham Park; research underway on Tilapia hybrid; c) Production per acre increased to 4,000 lbs for small producers and 10,000 lbs for large producers; d) Accurate records and statistics section established in Fisheries Division.</p>	<p>a) MOA and Fisheries Division records b) AID/GOJ final evaluation</p>	<p>Assumptions for achieving purpose: a) Large and small producers utilize services of Fisheries Division. b) Yield per acre forecasts are achieved.</p>																														
<p>Outputs: a) Personnel trained in inland fisheries development. b) Survey of ponds completed and extension program operational c) Upgrade physical facilities of Twickenham Park d) Production capacity expanded at Morelands and JIDC.</p>	<p>Magnitude of Outputs: a) 3 persons receive LT training (2 MM each), 6 persons receive ST training (2 MM each); b) 175 ponds surveyed; extension to 65 farmers; c) Laboratory, residence and 10 acres of ponds constructed or renovated; d) Production ponds expanded to 45 acres of Morelands and 20 acres at JIDC.</p>	<p>a) Project reports b) Interim evaluations c) MOA and Fisheries Division records</p>	<p>Assumptions for achieving outputs: a) Fisheries Division activity supports project by providing inputs as agreed upon. b) Participants return to positions in Fisheries Division c) Peace Corps cooperation obtained as agreed.</p>																														
<table border="0"> <tr> <td>Inputs:</td> <td colspan="2" style="text-align: center;"><u>Total</u></td> </tr> <tr> <td>(US \$000)</td> <td style="text-align: center;">U.S.</td> <td style="text-align: center;">GOJ</td> </tr> <tr> <td>a) Tech Assistance</td> <td style="text-align: center;">168</td> <td style="text-align: center;">155</td> </tr> <tr> <td>b) Participant Trng.</td> <td style="text-align: center;">81</td> <td style="text-align: center;">281</td> </tr> <tr> <td>c) Commodities</td> <td style="text-align: center;">60</td> <td style="text-align: center;">105</td> </tr> <tr> <td>d) Construction/renovation</td> <td style="text-align: center;">155</td> <td style="text-align: center;">81</td> </tr> <tr> <td>e) Salaries</td> <td style="text-align: center;">281</td> <td style="text-align: center;">622</td> </tr> <tr> <td>f) Administrative</td> <td style="text-align: center;">105</td> <td style="text-align: center;">355</td> </tr> <tr> <td>15% Contingency</td> <td style="text-align: center;">46</td> <td style="text-align: center;">81</td> </tr> <tr> <td></td> <td style="text-align: center;">355</td> <td style="text-align: center;">622</td> </tr> </table>	Inputs:	<u>Total</u>		(US \$000)	U.S.	GOJ	a) Tech Assistance	168	155	b) Participant Trng.	81	281	c) Commodities	60	105	d) Construction/renovation	155	81	e) Salaries	281	622	f) Administrative	105	355	15% Contingency	46	81		355	622	<p>Implementation Target (Type and Quantity)</p> <p>a) 36 MM LT tech. asst. 6 MM ST tech. asst. b) 6 MY LT training 12 MM ST training c) Equipment procured d) Construction/renovation complete e) 8 additional persons on board f) operational support provided by GOJ</p>	<p>a) AID and GOJ records and reports b) AID PIO/T, PIO/C and PIO/P documents.</p>	<p>Assumptions for providing inputs: -> Qualified AID advisor(s) available. b) Qualified GOJ participants available. c) AID and GOJ funding available on timely basis.</p>
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ANNEX E

PROJECT FORM
(May be Expanded as Appropriate)

Country: Jamaica	Project No: 532-0038	Project Title: Inland Fisheries	Date: 10-23-75	/ x / Original / / Revision #	PPT appr
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ANNEX E

country:	project no:	project title:	date:	/x / original	apprvd:
Jamaica	532-0038	Inland Fisheries	10-23-75	/ / revision #	
<u>CPI NARRATIVE</u>					
<u>1975</u>					
<ol style="list-style-type: none"> 1. November 15 - PP approved. 2. December 15 - Pro Ag signed 3. December 30 - Morelands Food Farms - initial stocking with fingerlings. 					
<u>1976</u>					
<ol style="list-style-type: none"> 4. March 1 - Two participants depart for 2 years long-term training each. 5. March 1 - U.S. contractor arrives 6. March 1 - Construction/renovation activities for buildings and ponds begins at Twickenham Park. 7. June 1 - 3 additional fisheries extension officers on board at time Twickenham Park lab and ponds renovated. 8. June 1 - First harvest at Morelands Food Farm; monthly thereafter. 9. August 1 - Four Peace Corps Volunteers arrive. 10. August 1 - All Twickenham Park construction and renovation complete. 11. August 1 - Laboratory commodities and vehicles arrive. 12. August 1 - Applied research program begins. 13. September 1 - Survey of privately owned ponds begins. 					
<u>1977</u>					
<ol style="list-style-type: none"> 14. January 1 - Pond survey of 175 farmers complete. 15. January 15 - Extension program to small producers begins. 					
<ol style="list-style-type: none"> 16. January 1 - JIDC initial stocking with fingerlings. 17. March 1 - Construction of 5 acres of ponds completed at Twickenham and ponds stocked with Tilapia hybrid. 18. June 1 - First harvest at JIDC; harvest monthly thereafter. 19. August 1 - First harvest at small producers ponds. 					
<u>1978</u>					
<ol style="list-style-type: none"> 20. January 1 - One participant departs for 2 years of long term training. 21. January 1 - Construction of 5 acres of ponds completed at JSA. 22. March 1 - Two participants return from long term training. 23. April 1 - Research program under complete GOJ supervision. 24. July 1 - Fisheries training course approved for inclusion in JSA curriculum in September 1978. 25. November 15 - Final project report and evaluation. 					



NATIONAL PLANNING AGENCY

**P.O. BOX 634,
KINGSTON,
JAMAICA**

ANY REPLY OR SUBSEQUENT REFERENCE
TO THIS COMMUNICATION SHOULD BE
ADDRESSED TO CHIEF TECHNICAL
DIRECTOR, NATIONAL PLANNING AGENCY,
12 CAMP ROAD, KINGSTON 4.

No. 743/03

7th March, 1975.

Dear Mr. Kolar,

Attached please find copy of project request submitted by the Fisheries Division of the Ministry of Agriculture on Research and Pilot Fish Farms which we hope your agency will give favourable consideration.

This project has been given a very high priority rating by the Government of Jamaica as it is geared to increase the island's fish supply thereby decreasing our import bill on fish.

Your usual kind attention will be appreciated.

Yours truly,

A handwritten signature in cursive script, appearing to read "L. N. White".

L. N. White (Mrs.)
for Chief Technical Director

Mr. Peter Kolar,
US/AID Project Adviser,
43 Duke Street,
KINGSTON.

Encl.

Project Request to US/AID
for Assistance in
Inland Fish Farm Projects

-38-

Country: Jamaica
Project Title: Inland Fish Farm
Date of Request: February 7, 1975
Requesting Agency: Ministry of Agriculture - (Fisheries Division)
Location: Twickenham Park, St. Catherine
Martha Brae, Trelawny.

Background and Purpose:

Although Jamaica is an island surrounded by water in which an abundant supply of fish abounds, the island suffers from an inadequate supply of this high protein food. The prime objective of this project is therefore to determine the extent to which Fish (including crustacea) Farming could be expanded to form a viable commercial enterprise. This will be done by conducting research regarding the biology - life - history, feeding habits etc. of the indigenous species; by developing multi-species culture/farming systems and also experimental farms to test the economic feasibility of the project.

This project is given a very high priority as it aims at increasing fish production for local consumption and thereby reducing foreign exchange. It is also in keeping with the Government's policy of optimum utilization of the country's natural resources inclusive of areas of swamp or marshy land that cannot be utilized primarily for traditional farming activities. Further, the pattern of distribution of fish (fresh) tends to concentrate supplies in the urban areas and it is felt that an expanded programme of fish farming will act as the medium in making fresh fish available to isolated rural communities.

Aims and Objectives

To increase our knowledge of local freshwater anadromous and estuarine species so as to develop a system or systems of multi-species culture/farming suitable for local conditions without having to make any introduction. If this is achieved then more efficient use would be made of our inland waters - rivers, ponds, lakes and swamps. Great importance will be attached to the commercial viability of fish farming in Jamaica and this would necessarily entail studies on the availability of local foodstuffs for supplementary feeding.

Personnel Requested

One (1) Freshwater Fish Biologist - (Graduate with experience in Tropical Freshwater Fish Farming and Research).

Job Description - "to direct research as outlined above, including the commercial tests to be carried out.

Local Counterpart Available

Personnel - One (1) experienced fish farmer or fish farm manager.

Job Description - To make a detailed examination of the site near Falmouth where it is proposed to locate the Pilot Fish Farm.

To prepare plans (design and lay-out) including details of cost of the pilot fish farm and associated buildings and equipment.

Duration of Service - 6-9 months.

Local Counterpart Available

Fellowships

The following officers would appreciate refresher courses in Auburn University or any other similar institution:

E. Royer B.Sc.
R. MooYoung B.Sc.
P. Silvera B.Sc.

Duration: Ranging from 2 weeks to 4 months (observation exercise).

Local officers will work as counter-parts to experts and if the request for scholarships are granted, then the local officers should be qualified to carry on projects after the experts have been withdrawn.

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LA/DR: BOSTONIAN (DRAFT)

LA/DR: ANDERSON LION

LA/DR: MURPHY

LA/DR: CVANHAFFTEN (DRAFT)

LA/DR: SHARPS (DRAFT)

LA/DR: JAHOUFZ (DRAFT)

LA/DR: SUDHARA (DRAFT)

LA/DR: R SIMPSON (DRAFT)

LA/DR: S. H. H. (DRAFT)

TA/DR: J. J. (DRAFT)

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TAGS:

SUBJECT: JAMAICA INLAND FISHERIES DEVELOPMENT PROP

1. THE DAFD REVIEWED SUBJECT PROP AND RESOLVED TO REQUEST THE MISSION TO FURTHER ELABORATE UPON THE PROPOSAL BEFORE FINAL APPROVAL COULD BE GIVEN. THE REVISED PROPOSAL SHOULD BE IN THE FORM OF A PROJECT PAPER (PP), AND SHOULD FOL-

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LOW THE AGENCY GUIDELINES SET FORTH BY THE AIRGRAMS REFERENCED BELOW:

--A. AIDTO CIRCULAR A-234, 4/19/75 (WITH ANNEXES A AND B) PROJECT TRACKING/REPORTING AND FINANCIAL DATA REQUIREMENTS PROPOSALS;

--B. AIDTO CIRCULAR A-241, 4/23/75 - REVISED PROJECT DEVELOPMENT, REVIEW AND APPROVAL SYSTEM;

--C. AIDTO CIRCULAR A-255, 4/26/75 - FINANCIAL DATA REQUIREMENTS AND PROJECT TRACKING/REPORTING - QUESTIONS AND ANSWERS;

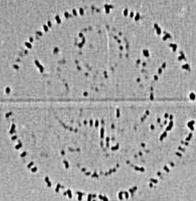
--D. AIDTO CIRCULAR - 339, 6/7/75 - REVISED PROJECT DEVELOPMENT REVIEW AND APPROVAL SYSTEMS - FACESHEETS.

2. THE MISSION IS REQUESTED TO TAKE INTO ACCOUNT THE FOLLOWING ISSUES AND QUESTIONS AS IT PROCEEDS TO FURTHER DEFINE THE PROJECT:

--A. THE DDC VIEWED THE PROJECT'S MAJOR GOAL AS IMPROVING THE OVERALL NUTRITIONAL STATUS OF THE ISLAND'S LOWER INCOME GROUPS; HOWEVER, THE THRUST OF THE PROJECT IS INSTITUTIONAL IN NATURE AND CONCENTRATES ALMOST WHOLLY ON THE GOJ'S FISHERIES DIVISION. THE INCREASE IN PRODUCTION ENVISIONED OF 15 MILLION POUNDS ANNUALLY DOES NOT SEEM A REALISTIC TARGET IN VIEW OF THIS STRICTLY INSTITUTIONAL AND RESEARCH ORIENTED FOCUS AND ABSENCE A SPECIFIC DELIVERY SYSTEMS AND PRODUCTION CONCEPTS. THE PP SHOULD INCLUDE A DISCUSSION AND ANALYSIS OF THE ELEMENTS OF SUCH A FISH PRODUCTION (AND DISTRIBUTION) PROGRAM, WHICH TOGETHER WITH THE INSTITUTIONAL INPUTS FROM AID, WOULD PERMIT THE PROJECT GOAL TO BE ATTAINED. THE PROJECT'S INSTITUTIONAL EMPHASIS SEEMINGLY OVERSHADOWS EFFORTS WHICH MUST BE TAKEN TO BOTH PRODUCE FISH AND MAKE IT AVAILABLE THROUGH COMMERCIAL MARKETING CHANNELS TO POOR PEOPLE IN SUFFICIENT QUANTITIES AT A REASONABLE PRICE. THE PP SHOULD PROVIDE SPECIFIC INFORMATION AS TO THE TYPE AND NUMBER OF FARMERS WHO WILL PARTICIPATE AND BENEFIT FROM THE PROGRAM, AND INFORMATION ON THE DESIGN AND IMPLEMENTATION OF THE DISTRIBUTION/MARKETING SYSTEMS.

--B. THE PP SHOULD ANALYZE THE CURRENT AND PROJECTED COSTS TO THE FARMER OF RAISING FRESH WATER FISH AND ESTIMATE WHAT FINANCIAL RETURNS ARE REASONABLE TO EXPECT AT THE FARM LEVEL AS WELL AS THE BROADER ECONOMIC BENEFITS

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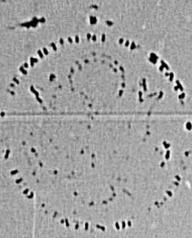
TO THE ECONOMY. THE FINANCIAL RETURNS SHOULD BE PROJECTED ON THE BASIS OF THE TECHNOLOGY PROPOSED TO BE USED BY BOTH THE GOV AND THE FARMER, THE PROPOSED RESEARCH WHICH WILL BE CARRIED OUT IN THE NEW FACILITIES, AND HOW BEST THE KNOWN TECHNOLOGIES CAN BE EXTENDED TO THE PRODUCERS. THE PP SHOULD DISCUSS THE PROPOSED METHODS TO BE USED TO REACH AND MOTIVATE THE FARMERS TO PARTICIPATE.

--C. THE DAEC CONCLUDED THAT THE FIRST STEP IN THE DEVELOPMENT OF THE PROPOSED PROJECT WOULD BE AN IN-DEPTH SURVEY OF THE ISLAND'S FRESH WATER FISHERIES POTENTIAL. IT IS POSSIBLE THAT THE RESULTS OF THIS SURVEY MIGHT INDICATE A SUBSTANTIALLY DIFFERENT APPROACH THAN NOW CONTEMPLATED IN THE PROP, I.E., NEW VARIETIES OF SPECIES OF FISH, EMPHASIS ON STORAGE AND MARKETING, ETC. THE DAEC ACCORDINGLY SUGGESTED THAT THE PROJECT MIGHT BE DIVIDED INTO TWO PHASES, WITH THE LATTER PHASE DEVOTED TO IMPLEMENTING AN ALIGNED PROGRAM RESULTING FROM THE STUDY AND RECOMMENDATIONS.

--D. THE PROP'S CRITICAL ASSUMPTION REGARDING FISH STORAGE AND MARKETING SHOULD BE ELABORATED UPON, INCLUDING AN ASSESSMENT OF THE CURRENT CAPACITY, SEASONAL VARIATIONS, DELIVERY SYSTEMS, MARKETS AND MARKETING POTENTIAL, CONSUMER PREFERENCE, AND LEVEL OF INVESTMENT NOW EMPLOYED. DOES THE PROJECT INVOLVE GRANTING OF INCENTIVES TO THE PRIVATE SECTOR THROUGH PREFERENTIAL CREDITS OR OTHER MEANS TO INDUCE AN EXPANSION OF THIS CAPACITY? ARE SUCH INCENTIVES DESIRABLE?

--E. THERE IS A NEED TO BE MORE IMPLICIT REGARDING PHYSICAL FACILITIES, SUCH AS: 1) MENTIONED IS MADE OF MANY TYPES OF PONDS NOW IN USE, SOME OF WHICH ARE QUITE DEEP INDICATING THAT HARVESTING OTHER THAN BY PULFS WOULD BE IMPOSSIBLE. THE EASE OF HARVESTING AND ITS ECONOMICS SHOULD BE CONSIDERED; 2) LAND USE ECONOMICS SHOULD BE CONSIDERED IN SELECTING POND SITES, RECALLING THAT THE FISHERIES-AQUACULTURAL EFFORTS SHOULD COMPLIMENT OTHER AGRICULTURAL PRODUCTION SCHEMES AND NOT BE COMPETITIVE; 3) PRESENTLY AVAILABLE FACILITIES SHOULD BE INVENTORIED AS TO PRESENT USE, COST OF REHABILITATION, ETC., AFTER WHICH, FACILITIES SHOULD BE RATED ON A PRIORITY SCALE AS TO LOGICAL AND NEEDED LOCATION, I.F., LABORATORY FACILITIES SHOULD BE LOCATED WITHIN OR ADJACENT TO RESEARCH

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FACILITIES. LOCATION OF COMMERCIAL HATCHERIES SYSTEMS SHOULD ALSO BE DIRECTLY TIED TO PRESENT DELIVERY SYSTEMS OF PLUNGING STOCK TO THE PRODUCERS.

---F. THE GOJ CONTRIBUTION SHOULD BE BROKEN OUT INTO ITS VARIOUS COMPONENTS IN ORDER TO CLARIFY THE EMPHASIS WHICH THE GOJ PLACES UPON THE VARIOUS ACTIVITIES, I.E., RESEARCH, EXTENSION, ETC.

---G. THE PP SHOULD ATTEMPT TO ASSESS THE ROLE OF WOMEN IN THE PRODUCTION, PROCESSING AND MARKETING OF FISH AND SHOULD MAKE RECOMMENDATIONS AS TO WHETHER THE PROJECT CAN FACILITATE IMPROVEMENTS.

---H. THE DAEC RECOMMENDED THAT AID/W PROVIDE THE TDY SERVICES OF A FISHERIES SPECIALIST TO ASSIST THE MISSION IN THE PREPARATION OF A PP. IT WAS ALSO RECOMMENDED THAT THE PP ELABORATE ON THE ROLE THE UMI MIGHT PLAY IN BOTH THE CONCEPTUALIZATION OF THE PROJECT AND THE ISLAND SURVEY TO BE UNDERTAKEN. IF THE HISTORI CONCURS, MR. DON MOSS OF AUBURN UNIVERSITY IS AVAILABLE FOR TDY FROM AUGUST 14 TO AUGUST 22 INCLUSIVE. MOSS WOULD BE PREPARED TO ADDRESS TECHNICAL ISSUES AND PREPARE REPORT FOR USAID. SALARY CAN BE PAID THROUGH A YA/AGR CONTRACT; MISSION WOULD PROVIDE FUNDS FOR TRAVEL AND PERDIEM. MISSION SHOULD ADVISE AND/W AS TO ACCEPTABILITY OF CONTRACTOR AND SUGGESTED DATES, AND PROVIDE TRAVEL AND PER DIEM ALLOTMENT/APPROPRIATION SOONEST SO THAT ARRANGEMENTS WITH MOSS CAN BE FINALIZED. ALSO, PLEASE INDICATE WHEN PP WOULD BE SUBMITTED TO AID/W AND WHETHER MISSION DESIRES TDY FINANCE OFFICER TO HELP PREPARE PP. INGERSOLL

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DRAFT PROJECT DESCRIPTION FOR PROJECT AGREEMENT

I. Project Description

It is the purpose of this project to assist the fisheries division, GOJ Ministry of Agriculture, to design and implement an inland fisheries program involving applied research, experimentation and an inland fisheries extension program.

II. Objectives

- a. A trained inland fisheries section within the Fisheries Division by the end of 1978;
- b. An efficient and improved Twickenham Park Fisheries Station;
- c. An applied research capability within the Fisheries Division;
- d. An increase in fish yields to 4,000 pounds per acre annually for small producers and up to 8-10,000 pounds per acre annually at Morelands Food Farm; and
- e. Establishment of an accurate records division within the Fisheries Division.

III. Project ComponentsAID

- 3 man-years of technical assistance in the field of warm water aquaculture.
- 9 man-months of short term advisory and training services.
- 3 persons trained at a graduate level in a technical aspect of aquaculture production at a U.S. institution.
- 1 man-year of short term training at a U.S. or third country institution.
- sufficient commodities to equip a fisheries research laboratory
- 6 vehicles to maintain a fisheries extension program and distribute fingerlings to producers' ponds.

GOJ

- Renovation of Twickenham Park and new construction of fish storage areas, ponds, and residence.
- Salaries for an increased staff (from 13.5 to 21.5 persons).
- Administrative and operating support.

IV. Implementation

The project will be implemented by the Fisheries Division of the Ministry of Agriculture. Technical assistance will be provided through an AID contract with a U.S. university with a demonstrated capability in the field of warm water aquaculture. The contractor will attempt to develop the capacity and expertise of the Fisheries Division by providing day-to-day operational guidance and on-the-job training to Fisheries personnel. Persons selected for training will be from personnel assigned to the Fisheries Division and the Jamaica School of Agriculture.

Production aspects of the project will involve extension work and close coordination with the government sponsored Operation G.R.O.W. project, the Jamaica Industrial Development Corporation (J.I.D.C.) and individual farmers/producers. The Fisheries Division will initiate existing pond surveys and extension efforts to small farmers/producers with the assistance of four Peace Corps Volunteers.

The marketing and distribution of fish will be undertaken, in part, by the J.I.D.C. and the Agricultural Marketing Corporation (A.M.C.). The A.M.C.'s distribution network includes a series of 35 Special Shops and 26 Mobile Units which are directed to Jamaica's poorer majority. Additional marketing will be through less formal, non-institutionalized channels such as local farmers' markets and higglers.

V. Evaluation

In the implementation plan joint project evaluations are scheduled annually. The 1976 evaluation will provide AID and GOJ managers with an indication as to the direction and progress of the project and the need for redefining project outputs, if necessary. The 1977 evaluation will be a more formal evaluation with AID/W assistance to determine if there is any basis to continue the project or to formally plan for the project's scheduled termination beyond the original three year plan.

An important element to these two on-going project evaluations will be the availability of inland fisheries production data - both in terms of costs and benefits. The project calls for the development of a fish culture data collection system. Data collection will be part of the Morelands Food Farm fisheries unit and the J.I.D.C. project. The extension agents will collect existing pond information through their survey. As the extension of intensive fish culture practices progresses, fish production data will be collected.

VI. Financial Obligations

U.S. Contribution:

AID agrees to obligate from FY 1976 funds an amount not to exceed \$151,000 for the following purposes: \$66,000 for one long-term fisheries specialist and approximately 3 man-months of short-term advisors;