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9. ABSTRACT

Reports the findings of the USAID fisheries consultant on the feasibility of developing an impact program in fish culture and management in Jamaica. The topics included are a description of the government fisheries service, a discussion of operations at Twickenham Park fisheries station and at Falmouth Demonstration Fish Farm, a summary of the food farm program, plans for the Jamaica Industrial Development Corporation, a description of the Jamaica School of Agriculture, and discussions of the technical assistance component, the training component, the commodity component, procedural strategy, and the itinerary of the consultant. An item of high priority is a detailed survey of the country's existing fresh water ponds. Accurate information is needed on pond size, location, accessibility, presence of noxious aquatic vegetation and fish, existence of drain structure, and water level during the dry season. Information is needed on the possibility of multi purpose use in irrigation of vegetable crops or pasture for livestock and the renovation required to place pond in condition for intensive or extensive fish culture. A survey of this type must be carried out before a rational plan for fish culture development can be designed and implemented.

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JAMAICA FISH CULTURE DEVELOPMENT PROJECT

by  
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USAID FISHERIES CONSULTANT  
August 29, 1975

\*The services of Dr. Moss, Professor of Fisheries, Auburn University, Alabama, were made available to USAID/Jamaica and the Government of Jamaica by AID/Washington.



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## BACKGROUND

The government of Jamaica has been interested for some time now in developing an improved fish culture production and management program under its Department of Fisheries of the Ministry of Agriculture. The USAID Mission responded to this interest by requesting short-term assistance through AID/Washington for a fisheries specialist to assess the need and potential for fish culture development in Jamaica. Subsequently, Professor E. E. Prather of the International Center for Aquacultures, Auburn University, Alabama, carried out a preliminary survey from June 17-29, 1974. At the conclusion of this visit he met with USAID officials and presented recommendations for an assistance program in fish culture development.

As a follow-up to Prather's preliminary survey, the USAID Mission requested the services of a second fisheries specialist to examine in greater detail the situation in Jamaica in reference to the feasibility of developing an impact program in fish culture and to provide technical expertise in assisting the USAID in preparing documentation for a project proposal.

The fisheries consultant, under arrangement with AID/W's Office of Agriculture, Bureau of Technical Assistance, was on duty status with USAID/Jamaica August 13-29, 1975. During this time period, he conferred with a number of officials in government and of the private sector and made limited trips to the field that he and the USAID Mission felt were essential to the primary task of project identification and preparation. The following sections were prepared by the USAID fisheries consultant for possible inclusion in the formal project proposal.

## THE GOVERNMENT FISHERIES SERVICE

The Fisheries Department of the Jamaican government is small particularly in regards to its effort in inland fisheries and fish culture. The professional staff at present consists of a fisheries officer who administers the overall program, which is heavily oriented toward the marine environment, plus three assistant fisheries officers. Of the latter, one is assigned to work in the marine area while another works primarily in inland fisheries. The third divides his time between freshwater and marine programs and assists in the administration of the Department. A fourth position at the assistant fisheries level is presently vacant. In addition to the professional staff who have Bachelor of Science degrees, there is a fisheries instructor and approximately 30 field assistants.

It is the opinion of the USAID fisheries consultant that the staff of the Fisheries Department will have to be substantially increased in order to implement a fish culture project in a successful manner. Certainly four biologists will be required on a full-time basis respectively to supervise and direct programs as they are developed for: 1). The Twickenham Park Fisheries Station, 2). Falmouth Demonstration Fish Farm, 3). The country-wide fish culture extension program, and 4). Principal counterpart of the USAID resident fisheries advisor who will be intimately involved in the planning and implementation of all of the various sub-projects comprising the fish culture development program. Finally it will be necessary for the Fisheries Department to provide qualified young men to serve as counterparts for each of the four to six Peace Corps Volunteers who will be associated with the fish culture project.

The personnel pattern as outlined above represents in the consultant's opinion, the minimal staff needs for successful implementation of a significant fish cultural program in Jamaica. It is quite likely that this staffing pattern will have to be further increased as programs become established and undergo expansion.

#### TWICKENHAM PARK FISHERIES STATION

This station is owned and operated by the Fisheries Division of the Ministry of Agriculture. It is approximately 20 years old and presently is the only government facility where fresh water fish culture can be carried out. In 1974 a total of 5,000 male African Perch fingerlings was produced for stocking local ponds.

When the USAID fisheries consultant visited the station on August 18, 1975, four ponds were in use with the two larger ponds (0.8 and 0.5 acres in surface area) stocked with African perch (Tilapia) while two smaller ponds of about 0.1 acre each were stocked with mullet and tarpon, respectively. A number of small earthen holding pools were dry and apparently not utilized on a regular basis.

Water is supplied to the ponds from an irrigation well located on the station. The volume of water being pumped appeared to be at least 500 gallons per minute, the bulk of which was being distributed by open ditch canals for irrigational purposes to an adjacent dairy and to the School of Agriculture located immediately across the highway from the fisheries station.

An additional land area of about four acres, contiguous with the existing pond complex and owned by the Fisheries Service, is available

for development into ponds.

Buildings of 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, stated to have been constructed 18 years ago, could be placed in operating condition at a reasonable cost. This structure would require an entirely new roof, windows, doors as well as complete remodeling interiorly, including installation of new electrical lines and a plumbing system. However, the basic masonry structure itself appeared to be in sound condition.

To place the Twickenham Park Fisheries Station in condition to permit it to be operated effectively as a fish culture research facility, the following would be necessary:

1. Existing water and drain lines should be improved to facilitate rapid filling and draining of ponds. The ponds proper will require some renovation of the dams and bottoms.
2. Several additional ponds are required. Hence, an engineering survey should be made to precisely determine the land area available for this expansion. Then a carefully designed pond construction layout, complete with cost estimates should be supplied individually with water inlet and outlet structures and should range in size from 0.1 to 0.2 acres each.
3. A relatively small but complete fish holding house is needed to hold crops of fish in good condition after harvest until data on weight, size, and number of fish can be accurately tabulated. This facility also is required to properly hold fish fingerlings prior to stocking into experimental ponds or into other ponds in the area. Approximately ten concrete tanks, 10 feet x 3 feet x 2 feet, supplied with good quality water on a continuous basis will suffice for this purpose.
4. A security type fence should be installed around the perimeter of the fisheries station to discourage poaching of fish as this has been a problem in the past.
5. Serious consideration should be given relative to constructing a modest residential structure at the station for the biologist in charge of the fish culture research program. It is highly unlikely that a meaningful experimental program can be achieved unless the biologist responsible for

this particular program actually resides at the station to closely supervise and direct the on-going work program on a daily basis.

There is a critical need to formalize the proposed experimental program by specifically stating the purpose of the research and indicating precisely the experimental design to be followed. Then accurate records and observations should be maintained of stocking, fertilization and feeding treatments with the resulting fish crops properly evaluated in terms of size and species composition. Also, total fish production must be evaluated economically.

Again it should be stressed that an effective fish culture research program will require the services of a well-trained and responsible aquaculturist on a full-time basis. Visits to the station on an infrequent or periodic schedule will not suffice.

6. If possible, additional land in the immediate area should be acquired and converted into experimental pond units as the number of ponds that can be made available on the existing land area will be inadequate to permit the rapid development of proven technological packages as needed for an expanded pond development program. Normally about 10 acres of ponds will be required. If it is not possible to acquire additional land here, then attention should be given in developing a secondary experimental pond complex in conjunction with the demonstration fish farm planned for the Falmouth area.

#### FALMOUTH DEMONSTRATION FISH FARM

The Fisheries Division (Ministry of Agriculture) strongly advocates the establishment of a pilot fish farm which can function specifically to demonstrate productive fish farming techniques to farmers and businessmen interested in initiating fish culture programs. The USAID fisheries consultant definitely concurs in this plan since limited land area at the Twickenham Park Fisheries Station precludes establishment of an adequate sized demonstration farm at that facility.

Fish culture programs will be held at the Demonstration Fish Farm at given time intervals to specifically demonstrate improved fish culture

techniques in which the participants will not only personally observe harvest of fish crops but also be properly exposed to the fundamentals of stocking of fingerlings, fertilization and feeding practices, and disposition of the fish crop through marketing channels.

Food fish produced at the Demonstration Fish Farm could be utilized to good advantage in the government's sponsored school lunch program in which currently some 50,000 lunches (soon to be expanded to 70,000) are prepared on a daily basis in the Kingston area alone. Also, the demonstration station could serve another important function by producing fingerling fish for use in stocking ponds throughout the country. The Twickenham Park Fisheries Station, even if expanded from its present limited size, will be of inadequate size to meet the nation's needs for fish fingerlings for an expanded farm fish pond development program.

The Government of Jamaica Fisheries Division has tentatively selected an area on the northern side of the country, inland from Falmouth, for development into a demonstration fish farm. The land is already owned by the Agriculture Development Corporation and apparently could be transferred to the Fisheries Division with minimal formality. It is anticipated that up to 15 acres of demonstration ponds will be required along with fish holding facilities and tanks plus a residence or other appropriate living quarters for field personnel working at the Demonstration Farm.

The specific site and design with appropriate construction details will be developed later, possibly with assistance of specialists made available under the technical assistance component of the proposed fisheries grant.

## FOOD FARM PROGRAM

An agrarian reform program is actively being carried out by the government in which lands suitable for agriculture but presently undeveloped or underutilized lands are either purchased outright, generally from absentee owners, 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). Lands acquisitioned through government lease are subsequently sub-leased to small farm operators, and 2). Land acquisitioned or already owned by the government is farmed by the government for production of agricultural commodities that are in strong demand and in short supply. The Ministry of Agriculture administers both programs which appropriately are termed the Land Lease Program and Food Farm Program.

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 good soil and water conservation and management can be practiced. Ground and water surface 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 a most important program.

Food Farm programs are being carried out at present in many different areas of the country. The USAID fisheries consultant, on August 22, visited Food Farm's Moorlands Project in which several hundred acres

of previously undeveloped "bush" land is being developed primarily for agricultural production of rice and fish.

The food fish production unit of Moorlands Farm will initially consist of approximately 14 production units of two acres each but there is ample space available for future expansion. With a pond design provided by the Fisheries Department, construction of the facility started in May and is scheduled for completion in October, 1975. Seven of the two-acre earthen ponds essentially have been completed except for installation of the drain structures and lines. Three other pond units were in an advanced construction stage with construction of the balance of the ponds to be started in the very near future.

Water to supply the ponds will be by low-lift pump from an adjacent irrigation canal where water is available in quantity even during the dry season to adequately supply the fish grow-out facility. The ponds are to be inter-connected and will be filled one from another. Drainage also will be effected by inter-connected drain lines in which water from one pond will be discharged to another at harvest time. Although this system does not provide optimal flexibility for achieving maximum fish production as would an individual or independent water inflow and drainage system for each pond, it certainly will make possible extensive reuse of water through multiple fish cropping practices.

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.

In order for the pilot fish farming project, the first operation of this kind in Jamaica, to be successful, it must be emphasized that adequate prior planning will be required on the logistical elements of the program with particular emphasis given to development of adequate supplies of fish aspects of pond fertilization, feeding and harvesting of the fish crop along with the processing, distribution and marketing.

In addition to proper design and construction of the physical facilities, it is highly important that the technological package with skilled technicians to implement it also be developed. Otherwise the project cannot function well to demonstrate the high potential that fish culture can have to the food supply and economy of Jamaica.

#### JAMAICA INDUSTRIAL DEVELOPMENT CORPORATION

This corporation of the private sector is in process of finalizing detailed plans for construction of an abattoir from a U.S. \$7 million loan to be made available to the Corporation from the World Bank. Initially the plant will have capacity to slaughter and process during an eight-hour day a total of 100 cattle, 150 hogs, and 50 sheep or goats. Executives of the corporation are interested in developing a fish farm in conjunction with the abattoir in order to effectively utilize processed offal as fish food and the enriched waste water effluent, after appropriate biological purification in sewage lagoons, for fish production. While choice cuts of red meat may be destined to supply the hotel trade or exported to adjacent countries, fish will be entirely for local consumption.

Location of the plant will be approximately 17 miles west of Kingston near Amity Hall on a 59-acre plot of land made available to the project by

GOJ's Agricultural 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 project lands is available for fish pond production units.

The USAID fisheries consultant inspected the site area on August 14, 1975, and his comments are presented in summary form as follows:

1) The site area is conveniently located very near a well maintained paved highway and railroad about 17 miles west of Kingston. Thus, transportation infrastructure to major cities within the country is already in place and assured.

2) High and low voltage power lines already service the project area. Hence no expensive installation of power lines will be required.

3) A deep well with electric motor and pump is already in place which provides 400 gallons per minute. Flow data indicated that a total of 141.2 million gallons water was pumped during 1974 for irrigation purposes. Thus, an adequate volume of water to operate the abattoir at maximum capacity (300,000 gpm daily) is guaranteed.

4) Soil in project area consists primarily of alluvial clays to a depth of ten feet or more. Such soils are excellent for pond construction and water seepage though sub-soil is minimal.

5) Topography of land is gently sloping with a fall of approximately five feet from the northwest to southwest extremities. This would permit economic pond construction and with proper design, filling of fish production units by gravity without resorting to second-stage pumping devices.

6) Organic manures may be collected from livestock holding pens and used directly to enrich pond waters to increase fish production. Also, wash waste water from the slaughter house containing blood and other organic materials can be utilized, after biological purification in organic sewage lagoon, to provide additional enrichment for fish production units and to replace pond water lost through evaporation and seepage. Offal of both livestock and fish can be processed by the plant into tannage or meal and used as a supplemental feed for fish or other animal production operations.

7) Water flowing through fish production units subsequently can be utilized for irrigation of lower lying land areas adjacent to the plant site which presently are in cane production

by the Agriculture Development Corporation.

8) A fish processing unit can be consolidated into the plant design which not only will accommodate fish crops from the plant's fish production units but from other commercial fish production units which are presently under construction or developed in the future.

9) Market development and distribution of fish and fishery products can proceed simultaneously with similar infrastructure development as required for red-meat lines.

10) Based on existing production data from a USAID supported fish culture project in Northeast Brazil, where climatic conditions are similar to that of Jamaica, one acre of water with proper management will produce 4,000 pounds of African perch (Tilapia) annually. If more intensive culture methodology is practiced - such as continuous harvesting and restocking rather than periodically draining ponds to harvest fish crop and then starting the production cycle again - it should be possible to achieve a production of 10,000 pounds per acre per year.

11) Initially ten acres of food-fish production units should be constructed. Ponds should be one to two acres in size, rectangular in shape to facilitate harvest by seining, and equipped with drains so that the ponds could be completely and rapidly drained. It also would be advisable to install a fresh water supply line to each pond which could be utilized for introducing water of good quality when extremely low dissolved oxygen levels for prolonged periods might otherwise occur in the production ponds.

12) Ten acres of fish ponds producing 4,000 pounds fish per acre will result in a total annual fish production of 40,000 pounds. To manage the fish production facility in an efficient manner, the services of a biologist with some experience in fish culture will be required on a full-time basis. Also, a dependable supply of fingerlings, approximately 10,000 per acre or 100,000 annually, will be needed. Although it is possible that these can be obtained from private sources or the government's fisheries service, it is more likely that the project will have to produce its own fingerlings for production of food fish. If so, several additional hatchery ponds will be needed for this purpose.

#### JAMAICA SCHOOL OF AGRICULTURE

This school functions as a vocational training school providing

practical farm training for young people going into various fields of agriculture. These graduates are in strong demand both by the private agriculture sector and various government departments. After completing the three-year curriculum provided at the Agriculture School, students may elect to continue their education at the University of the West Indies where they may obtain a B.S. degree upon successful completion of two additional years of study.

Enrollment at the School of Agriculture varies, but it is anticipated that approximately 200 students will complete the three-year program ending in December, 1975. This school is located in Spanish Town, about 12 miles west of Kingston. It owns and operates approximately 1000 acres of land, a good portion of which is excellent agricultural land devoted to beef and dairy cattle and other livestock production. It is interesting that the School of Agriculture is located immediately across the road of the Twickenham Park Fisheries Station.

The School of Agriculture could very well serve as a resource pool for fish culture extension agents. It would require that a sound background course in the basic principles of aquaculture be provided with emphasis on practical or applied problems most frequently encountered by farmers who grow fish for food and profit.

It is recommended that the USAID resident fish culture advisor who may be provided under the technical assistance component of the fish culture project, with an appropriate Jamaica School of Agriculture counterpart, initiate a practical fish culture course at the School of Agriculture for the purpose of training personnel who could subsequently be available to work as fish culture extension agents for the government service or as pond managers for the private sector.

Assuming Institute officials are interested in expanding their training program to include aquaculture, it is recommended that the USAID allocate funds under the fish culture project both for pond construction and for participant training for selected staff of the Institute. It also should be emphasized that food fish produced in Institute ponds could be utilized to very good advantage in the School's lunch program. Also water from the pond production system could be used for irrigation of pasture or truck crops on adjacent lands of the School.

#### TECHNICAL ASSISTANCE COMPONENT

Due to the limited involvement in inland fisheries programs by the Fisheries Division of the Ministry of Agriculture, staff development in this area of fisheries to date has been very minimal to say the least. At present there are only two biologists, assistant fisheries officers, devoting any effort to inland fisheries. These are relatively young men, and although college graduates, they have had no formal training in aquaculture as such. It is imperative to the success of the fish culture that an adequate technical assistance component be included.

The USAID fisheries consultant recommends 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 most likely result in maximum impact to the country and improvement of 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 also will coordinate the in-country training program so that a qualified and competent staff will 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, fish economics and marketing. These specialists very likely will be needed to solve specific problems as they are encountered and also for the purpose of conducting short course type instructional programs in-country. It is recommended that a minimum of three man-months of short-term consulting services be provided on an annual basis under the grant.

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 USAID fisheries consultant also recommends that immediate steps be taken to involve the U.S. Peace Corps in the fish culture project.

In USAID sponsored fish culture projects in El Salvador and the Philippines, Peace Corps Volunteers have contributed significantly to on-going fisheries research and extension programs when their activities were skillfully directed by an experienced advisor. The Volunteers with appropriate counterparts would be especially useful in carrying out an

in-depth survey of the existing ponds in Jamaica. It is suggested that initially four Peace Corps Volunteers be recruited to be in-country as early as possible after the grant is approved, and that the number of Volunteers be increased to six during the second and third years of the project. Job descriptions should specify college graduates with degrees in fisheries with preference being given to applicants having formal courses in fish culture.

#### TRAINING COMPONENT

Of the various components included under the fisheries grant, the training of an adequate number of host country personnel at an adequate level not only will increase the opportunity for a successful project during the grant period, but it also will make possible the achievement of greater impact over a much longer time period. Effort also must be made within the project's training component to firmly establish a linkage with an existing institution in Jamaica whereby training in applied or practical fish culture will be available to other young people after the project is terminated.

With these thoughts in mind, the USAID fisheries consultant proposes the following:

1. A minimum of four long-term participant training positions, each of two years in duration, should be included under the grant that will enable recipients opportunity to earn Master of Science degrees at American institutions offering good curriculums in aquaculture and closely allied disciplines.
2. The initial participant slot should be programmed for departure from Jamaica as soon as possible after the grant is finalized in order that he can complete his degree program and rejoin the fish culture project before the USAID grant is terminated.

This would permit the Fisheries Department aquaculturist to work closely with the USAID resident fisheries advisor and thereby gain valuable field experience and increased competence in directing a viable program.

One participant training position should be reserved for a selected staff member of the Jamaica School of Agriculture on the assumption that this institution will expand its present agricultural oriented program to include practical courses in fish culture. The remaining two long-term participant training positions should be awarded to the Fisheries Department.

3. Special study tours to the United States and third countries should be included in the training component. It would be especially advantageous, for example, for selected staff of the Fisheries Department and the Ministry of Agriculture to visit the USAID fish culture project in northeast Brazil. These staff should examine in detail the experimental program that has been in progress for about five years. Specific attention should be given to technological packages which have already been formulated for implementation in the fish farmer extension program. Various culture systems with similar fish species that occur in Jamaica may be transferred directly and thus avoid expensive duplication in experimental programs and field trials. Also study tours to various commercial fish farming operations in southern United States would allow these staff to personally observe the methodology utilized in production, harvesting, processing and marketing of fish crops.

4. Short-term programs of training also should 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 program could be carried out on an annual or semi-annual basis by a group or two or three professors in various specialty areas from an American university which has an established reputation in the fisheries field.

#### COMMODITY COMPONENT

Implementation of the fish culture development program will necessitate logistical support in terms of an adequately financed commodity component. 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. Moreover, fish culture in Jamaica

is presently in such an undeveloped state that even the more basic items required are not available in local markets. Hence, most of the laboratory field equipment will have to be imported.

The USAID fisheries consultant estimates, based on his experience with similar USAID sponsored aquaculture projects, that a minimum of \$25,000 per year, or \$75,000 for the three-year grant period will be required to place the fish culture project in operating condition in terms of mounting a significant experimental, demonstration and extension program.

Also, fish culture is a type of agricultural program which requires work plans being carried out in the field on a continuous basis. Hence, U.S. staff including Peace Corps Volunteers with host country personnel who will be affiliated with the project must have reliable transportation if their services are to be utilized in an effective manner. To expect the host country to supply this transportation in addition to absorbing costs resulting from employment of a substantially increased staff and a greatly expanded annual operating budget, does not appear to be realistic. Thus, it is recommended that a minimum of four vehicles in good operating condition be acquired by the USAID Mission specifically for use in the fish culture project. Purchase or cost of project vehicles was not included in the commodity budget figure given above.

#### PROCEDURAL STRATEGY

Since the grant is limited to a three-year period, it is essential that adequate advanced planning be carried out in all program areas with subsequent implementation of the various sub-projects in a logical sequence.

In reference to long-term participant training, the first participant should be programmed for study at an appropriate U.S. fisheries institution as soon as possible after the grant has been finalized. The other three participants should be identified, with the resident USAID fisheries advisor providing assistance in interviewing and reviewing academic credentials of the prospective candidates, and depart on their study programs early in year two of the project. This would result in all participants returning to Jamaica prior to the termination date of the grant. Also, this would permit the first returning participant to work hand in hand with the USAID fisheries advisor for a period of one year. This of course will enhance the capability of the host-country biologist to direct an active fish culture development program.

Short-term study or observation trips to third countries and to the United States by senior staff of the Fisheries Department and other key personnel of the Jamaican government should be made at an early date in order that these senior personnel may personally observe established fish culture programs. Particular effort should be made in arranging observation tours in such a way so as to properly expose the host country staff to all elements of commercial fish farming as well as to a well organized hatchery management operation, an active experimental fish culture operation and an effective fish culture extension program. Short-term training programs in-country could be carried out periodically on a schedule determined to be most appropriate by the host country and the participating U.S. fisheries institution.

One of the work programs in need of very early implementation is that of a detailed survey of the country's existing fresh water ponds. According to the Fisheries Service, approximately 350 farm ponds were

stocked with African perch (*Tilapia*) during the period 1967-1970.

Although the Fisheries Department estimates the total number of farm ponds range from 700 to 900, no data are available on the total surface area of water or suitability of the ponds for fish culture. An in-depth survey is needed to provide accurate information on pond size, location, accessibility, presence of noxious aquatic vegetation and fish; existence of drain structure, water level during dry season, possibility of multi-purpose use in irrigation of vegetable crops or pasture for livestock and renovation required to place pond in condition for intensive or extensive fish culture. It is essential that a survey of this type be carried out before a rational plan for fish culture development can be designed and implemented.

The Twickenham Park Fisheries Station presently is not being maintained in a fashion which allows it to function efficiently either as a fish hatchery or an experiment station. Unfortunately, even with the addition of earthen ponds in the land area presently available for this purpose, the limited size of the fisheries station will be such that it cannot adequately serve to produce the numbers of fish fingerlings required for an intensified fish culture program or the replicated field trials needed in a good experimental program. Hence, additional pond units ultimately will have to be developed at other locations. Still it is imperative that the earthen pond system with appropriate support buildings be renovated and expanded. The government should proceed forthwith to develop the necessary engineering designs and cost estimates of ponds and buildings that will be required to allow the Twickenham Park Fisheries Station to function in an efficient manner as an aquaculture production unit. A similar detailed planning and design exercise will be required

for the Fisheries Department's proposed Fish Culture Demonstration Farm to be located on the northern coast near Falmouth and for the aquaculture training and teaching facility that may be developed at the Jamaica School of Agriculture.

ITINERARY

D. D. Moss  
USAID FISHERIES CONSULTANT

(Wed.) August 13, 1975

Arrived Kingston 5:20 p.m. from Bogota, Columbia. Met at airport by Mr. John Dunlap, USAID.

(Thurs.) August 14, 1975

Briefing by Mr. John Dunlap, USAID, followed by conference with Mr. Charles Campbell, USAID Mission Director. Visited site of planned abattoir near Amity Hall with Dr. Carl Wells, Jamaica Industrial Development Corporation and later met with Mr. R. E. Nevers, Engineering Department, JIDC.

(Fri.) August 15, 1975

Conference with Mr. Eustice Royer, Deputy Fisheries Officer and Mr. Roy Moo-Young, Assistant Fisheries Officer, Fisheries Department of the Ministry of Agriculture. Afternoon at USAID.

(Sat.) August 16, 1975

(Sun.) August 17, 1975

(Mon.) August 18, 1975

Meeting with Mr. L. McLaren, Chief Technical Officer, Ministry of Agriculture. Afternoon visit to Twickenham Park Fisheries Station with Mr. John Dunlap, USAID, and Mr. Roy Moo-Young, Fisheries Department.

(Tues.) August 19, 1975

Conference with Mr. Richard Nishihara, Deputy Director, U. S. Peace Corps/Jamaica and Mr. Donald A. Drga, P.C.V. Afternoon USAID.

(Wed.) August 20, 1975

USAID, reviewing project documentation and reports.

(Thurs.) August 21, 1975

Joint conference with Mr. Douglas Graham, Chairman, Agricultural Development Corporation and Mr. Charles Campbell, USAID Mission Director.

(Fri.) August 22, 1975

Morning at USAID; afternoon field trip to Food Farm's Moorlands Project with M. C. J. Morrison, Deputy Permanent Secretary, Ministry of Agriculture, Mr. C. A. Franklin, Deputy Director, Project Food Farms and Mr. Charles Campbell, USAID Director.

(Sat.) August 23, 1975

(Sun.) August 24, 1975

(Mon.) August 25, 1975

USAID, reviewing project documentation and report writing.

(Tues.) August 26, 1975

Meeting at the Ministry of Agriculture with Mr. John Dunlap, USAID, and Mr. C. J. Morrison, Deputy Permanent Secretary; Mr. C. C. Barrett, Director, Food Farm Project; Mr. C. A. Franklin, Deputy Director, Food Farm Project; Dr. Irving Johnson, Acting Chief Technical Officer, and Mr. Roy Moo-Young, Department of Fisheries. Afternoon at USAID.

(Wed.) August 27, 1975

Joint conference with U. S. Ambassador Sumner Gerard and Mr. Charles Campbell, USAID Director. Afternoon at USAID.

(Thur.) August 28, 1975

Meeting with Dr. Aston Wood, Principal, Jamaica School of Agriculture and Mr. John Dunlap, USAID. Afternoon at USAID.

(Fri.) August 29, 1975

Final conferences with USAID officials and departure from Jamaica in afternoon.