



An Evaluation of Fishery and Aquaculture Programs of the Agency for International Development (1982)

Pages
169

Size
8.5 x 10

ISBN
030932890X

Marine Technical Assistance Group; Ocean Policy Committee; Commission on Physical Sciences, Mathematics, and Resources; National Research Council

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DK4 Marine Technical Assistance Group
O+2 Ocean Policy Committee
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National Academy Press
Washington, D.C. 1982

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Available from

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Ocean Policy Committee
National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Printed in the United States of America

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EXECUTIVE SUMMARY

This evaluation of fisheries programs of the Agency for International Development (AID) was undertaken by the Marine Technical Assistance Group (MTAG), of the Ocean Policy Committee, in response to a request from that agency. It is part of a larger study of U.S. technical assistance and cooperation in oceanography, marine fisheries, and inland fisheries, including aquaculture. This report includes a brief review of the pattern of AID assistance efforts in fisheries since World War II, detailed analysis of three major fisheries programs, summaries of a number of regional programs, and a series of conclusions and recommendations on how the effectiveness of future programs might be improved.

Immediately following World War II, U.S. foreign assistance in fisheries was directed mainly toward the development of modern commercial fisheries as a means to strengthen the economies and rapidly increase the food supply in countries with serious food deficits. This effort involved large-scale programs to provide boats, gear, harbors, and processing equipment and to retrain local fishermen and fisheries workers in the use of modern equipment. Usually AID was directly responsible for hiring experts and supervising programs. Large-scale programs in Korea and India followed this pattern, as did a number of smaller programs in other parts of the world.

During the late 1960s, U.S. foreign assistance began to be directed more specifically toward the poorest people in developing countries. Large industrial fisheries development programs were curtailed in favor of ad hoc projects, generally tied to agricultural development programs. AID attached a lowered priority to fisheries during this period and most of the agency's own expertise in fisheries was lost. AID did serve as the lead U.S. agency in a domestic program largely carried out by the Bureau of Commercial Fisheries (now the National Marine Fisheries Service) during the late 1960s to develop a process for production of fish protein concentrate. The program was a failure and further reduced AID interest in marine fisheries as a target for development assistance.

More recently there has been increased interest in fisheries within AID, much of it directed toward aquaculture. However, fisheries activities are accorded a relatively minor position within the administrative structure of AID, and funding for fisheries programs constitutes only a small portion of AID's expenditures for enhancement of food production techniques.

At least three factors justify an expanded fisheries program within AID:

- Congressional support for such an increase is indicated by the inclusion of Sea Grant Colleges within the Title XII revision of the Foreign Assistance Act and by the inclusion of fisheries as a priority area of food production.
- Limitations in agricultural production are becoming apparent in the decreasing amount of land available for agriculture and in the increasing marginal cost of agricultural production. Fisheries assistance often has been suggested as an economical alternative to enhancement of agricultural production.
- Developing countries are expressing increased interest in exploiting and controlling the resources within their recently acquired 200-mile exclusive economic zones, and the United States has an interest in gaining access to these zones for trade, scientific research, and for defense purposes.

The report considers the following project mechanisms used by AID to support fisheries programs:

1. Direct funding and supervision of programs by AID, usually involving AID employees in an operational capacity in a foreign country.
2. Use of U.S. universities as sources of expertise and sometimes as management entities for development programs.
3. Funding through a regional or international organization, which assumes responsibility for managing the program.
4. Joint programs in which foreign governments exercise operational control and the United States provides funding, expert advisers, and training.

The Marine Technical Assistance Group did not examine all of the mechanisms by which AID's fisheries assistance is carried out, although the mechanisms selected for study are typical of those used in other fisheries assistance projects. Restrictions of time and money limited the analysis to review of AID reports and evaluations supplemented by information provided by program participants. The programs that were examined in greatest detail were the Korean Fisheries Revitalization Program (1956-64) and programs at the University of Rhode Island and

Auburn University, funded under Section 211(d) of the Foreign Assistance Act during the period 1969-79. The Korean program is an example of a direct-funded and AID-supervised effort to assist the commercialization of fisheries. The latter two programs illustrate the use of universities as executing agencies and sources of expertise for AID fisheries operations. Through their outreach activities, the university-based programs also involve cooperation with foreign governments. Various mechanisms described in paragraphs 3 and 4 above are illustrated by projects reviewed in less detail; these are the Guinean Trawling Survey (1962-66), the East African Freshwater Fisheries Organization Project (1967-72), and fisheries development programs in the Philippines (1970-81) and in India (1952-62).

KOREAN FISHERIES REVITALIZATION

The Korean program was intended to revitalize the local commercial fisheries that had been devastated by war and economic hardship. New vessels, gear, processing facilities, and fishing methods were successfully introduced through fishery experts who were hired by AID and were able to gain the confidence and respect of the Korean fishermen. The project was designed to develop an export industry and to modernize facilities for fish handling and processing. However, there was little apparent attempt to develop artisanal fisheries or to follow through on certain aquaculture initiatives. An existing system of government fisheries administration and management was revised to make it responsive to the needs of the new fisheries, and technical capabilities and scientific fisheries institutions were strengthened.

The Korean program was quite successful and probably was a major factor in the reemergence of Korea as one of the world's leading fishing nations. Success appears to have been achieved in part through the strong, continuing support from AID and through effective supervision and the employment of experts with considerable field experience. Success was due also to the enthusiastic involvement of Koreans at all levels in the program and the willingness of fishermen and others in the industry to accept change. The postwar conditions in Korea and a large U.S. presence, both physically and financially, also had a good deal to do with the success of the program. Another important factor was the existence of an office for fisheries in AID at that time and the availability of fisheries expertise within the AID central organization, which provided strong management support to field operations.

FISHERIES AND AQUACULTURE PROGRAMS AT U.S. UNIVERSITIES

U.S. universities have long provided expert field staff for fisheries programs of U.S. and U.N. assistance agencies. This involvement of the universities was formalized when Section 211(d) was added to the Foreign Assistance Act in 1966. The purpose of the

section was to enable AID to provide funding to U.S. educational and research institutions "to strengthen their capability to develop and carry out programs concerned with the economic and social development of less developed countries." AID selected two universities to serve as centers of excellence in fisheries; Auburn University was to be responsible for aquaculture and inland fisheries, and the University of Rhode Island was to be responsible for marine fisheries, especially small-scale and artisanal fisheries.

The University of Rhode Island established the International Center for Marine Resources Development (ICMRD) as the vehicle for the 211(d) effort. This was a coordinating unit with a director and a small staff, whose function was to encourage the involvement of the university faculty in marine resource problems of developing countries. In this way, the university was to have built up a large pool of committed and experienced faculty members who would advise on AID programs and would themselves become involved in overseas activity. The approach was only partly successful, however. Only a rather limited group composed mainly of resource economists became actively involved, although fisheries scientists, food technologists, and others were active from time to time. The 211(d) objective of establishing linkages with other universities was achieved to a limited extent, in part because the International Center for Marine Resources Development was the administrative office for the Consortium for Development of Technology (CODOT), a food science and technology group representing five major U.S. universities. Overseas programs were pursued most actively in Central America, although a few short-term or seminar activities were carried out in Africa. AID exhibited little interest in marine fisheries during the period of the 211(d) program at the University of Rhode Island (1969-79) and made relatively little use of the expertise developed under the program.

The 211(d) grant to Auburn University was intended to strengthen the university's existing activities in overseas aquaculture development, including the International Center for Aquaculture (ICA), a unit within Auburn's College of Agriculture. The operation of ICA in response to requests from AID was largely independent of the university; there was little involvement by other members of the Auburn faculty or by professionals from other universities. The staff of ICA maintained close contact with AID and was frequently called upon to conduct surveys and demonstration projects overseas. ICA played a key role in carrying out AID's program in pond aquaculture, the principal focus of AID's interest in fisheries over the past decade. Although the center for aquaculture carried out some research and trained a number of students, it functioned mainly as an extension of AID and maintained only limited contacts with the rest of the university. The objectives and function of ICA were narrowly conceived and greatly limited the advantages AID could expect from working through a university. The research tended to be project-specific rather than concerned with basic issues in aquaculture; development activities stressed technical

matters and were weak in social and economic aspects of development; and the extent of linkage with other institutions was minimal.

The University of Rhode Island and Auburn programs both suffered from a lack of policy direction from AID. This clearly arose in large part from the lack of high-level expertise in fisheries within the agency. Although it is reasonable to expect university units to act independently, policy guidelines are needed, and a point of contact with fishery experts at a high level within AID is most desirable.

This evaluation of the two university-based programs does not resolve the question of whether universities should be encouraged to develop relatively autonomous quick-response units primarily for overseas operations or should promote interest in development-related activities among faculty in existing departments. The Auburn program demonstrated that in supporting a university unit dedicated to overseas assistance activities, AID loses some of the advantages of working with a university. On the other hand, the University of Rhode Island's approach lacked the close coordination necessary to permit extensive participation in AID's overseas operations. Both programs demonstrated the need for establishing formal contacts among institutions and individuals within the United States and abroad. It is possible that the institutional support grants under Title XII of the Foreign Assistance Act will provide for alternative mechanisms involving more universities and consequently more extensive networks of institutions and fisheries experts concerned with problems of developing countries.

Advantages and disadvantages of regional approaches to fisheries development are discussed in light of the rather small body of evidence provided in the reviews of AID projects discussed in Appendix B.

ISSUES AND RECOMMENDATIONS

The following issues, discussions, and recommendations are elaborated more fully in the text.

1. Should the United States provide fisheries assistance to developing countries?

U.S. fisheries assistance programs have potential benefits, both immediate and long-term, far outweighing their costs. These would accrue to both the United States and the recipient countries. On balance, U.S. fishing industries and consumers would benefit from such programs. Moreover, U.S. fisheries assistance would advance various national political and strategic objectives.

RECOMMENDATION: The United States should provide fisheries assistance to developing countries. Such assistance is warranted both for humanitarian reasons and from the broadly utilitarian perspective of achieving U.S. foreign policy objectives.

2. Does the United States have the technical and institutional capability to provide fisheries assistance in developing countries?

Although fisheries constitute a relatively small part of the U.S. economy, the United States possesses considerable scientific, technological, and managerial expertise in fisheries-related fields. Much of this expertise is unavailable elsewhere. In addition, various U.S. institutions have the capability and experience to assist developing countries in their fisheries programs. The United States therefore could make valuable contributions to global fisheries development.

RECOMMENDATION: There is a significant body of fisheries expertise and technology within the United States that should be made available to developing countries seeking to survey, exploit, or manage their fisheries resources. U.S. organizations and agencies should be encouraged to participate in fisheries programs in developing countries, including joint programs in concert with other donors.

3. Should AID be the lead U.S. agency for delivering U.S. assistance to developing countries in fisheries and aquaculture?

RECOMMENDATION: Because of its statutory mandate as the central U.S. foreign assistance agency, AID should remain the primary sponsor and coordinator of U.S. fisheries assistance programs. AID should maintain close contact with other organizations that have fisheries expertise, particularly the National Marine Fisheries Service. AID should use these organizations as executing agencies and, where appropriate, enter into joint projects with other fisheries assistance donors.

4. Is the present AID structure adequate for the administration of large-scale fisheries assistance programs?

RECOMMENDATION: AID should enlarge its in-house fisheries staff, including representation at the policymaking level, and should remove fisheries programs from administration by the agricultural office. The AID fisheries staff should define a coherent AID fisheries development strategy that includes the types of assistance to be offered, the priority to be accorded to various types of fish production methods, and the criteria by which requests for fisheries assistance will be assessed for funding. The stationing of fisheries experts at AID headquarters in Washington should be supplemented by fisheries professionals serving in AID field missions.

5. Should AID seek participation by U.S. universities in its fisheries programs abroad?

RECOMMENDATION: AID should use the fisheries expertise of U.S. universities to the fullest extent possible. However, the core support mechanisms, such as the Section 211(d) or institution-strengthening

grants, require large and indefinite expenditures and sometimes have not been fully utilized by AID in field projects. Therefore, AID should simultaneously explore other mechanisms for tapping into U.S. academic fisheries expertise, for example, institution-to-institution linkages. In particular, AID should apply to its fisheries programs abroad the special expertise of U.S. universities that is not widely available from other donors--e.g., basic fisheries research and statistics, stock assessment, food and nutrition, resource economics, socioeconomic impact assessment, and coastal zone management.

6. What lessons can be gleaned from past U.S. fisheries assistance programs?

Successful AID fisheries programs examined by MTAG have been distinguished by major U.S. financial backing, long-term commitments, broad integrated programs encompassing all aspects of the fishery from capture to market, expert advisers with practical experience (domestic and overseas), working relationships with local institutions, and flexible program administration that reflects the fundamental nature of fisheries. Successful programs have occurred in regions with good resource bases, traditional importance of fish in the local diet and economy, and strong recipient government commitments to fisheries development.

RECOMMENDATION: Proposals for AID fisheries programs should be assessed in light of the factors, enumerated above, that have typified past successful programs. Selection of recipients should be based on the likelihood of success. Program evaluation should be a continuing priority. AID likewise should examine the factors that have contributed to success or failure of past fisheries programs, including those of other donor agencies, to evaluate plans for future programs. However, AID should recognize that recipient needs and the ingredients for success may evolve over time.

7. How can AID best address the needs of recipient countries in its fisheries programs?

RECOMMENDATION: The pressing needs of developing countries require emphasis on improved management and better use of current fish stocks through capture fisheries programs. At the same time, AID should not lose sight of the enormous long-range potential of aquaculture. AID funding patterns in fisheries should reflect these priorities.

CHAPTER 1

INTRODUCTION

PURPOSE

The political order of the world's oceans has changed drastically during the past decade. This change derives from a combination of technological advances and diplomatic/political initiatives, particularly in the United Nations Conference on the Law of the Sea (UNCLOS). As a result, most coastal developing countries have already claimed enlarged jurisdiction over adjacent ocean spaces. They will likely request external assistance to maximize returns from the fisheries resources off their coasts. The U.S. Agency for International Development (AID) has been the primary U.S. government actor in fisheries assistance and probably will administer future U.S. assistance efforts. AID therefore requested that the National Research Council's Ocean Policy Committee evaluate its overall fisheries assistance program with a view toward identifying promising mechanisms for future projects.

This report was prepared by the Marine Technical Assistance Group (MTAG) of the Ocean Policy Committee. The information contained herein was gathered as part of a study undertaken by MTAG with funding from the Department of State, National Oceanic and Atmospheric Administration, Agency for International Development, and the Department of the Navy. Its purposes are to examine past U.S. marine technical assistance objectives and mechanisms and to make recommendations regarding future U.S. assistance to developing countries in fisheries and oceanography.

METHODOLOGY

During the period 1948-80, there were nearly 120 fisheries projects supported wholly or in part by AID or its predecessor, the International Cooperation Administration. These have ranged from provision of short-term experts or training to large schemes involving ships, equipment, and scientific personnel. Numerous agencies both public and private have participated in these projects, and the administrative mechanisms used have varied widely. The success or failure of projects and programs is difficult to measure because the results should be

evaluated only in the long term and because they may be masked by other events, such as local wars or changes of government. Likewise, the meaning of success and failure may shift as perceptions of "development" evolve and as relations between the United States and the recipient country undergo change.

Consequently, MTAG has not attempted a comprehensive evaluation of all AID fisheries programs. Given limited time, resources, and information (only documents available from U.S. agencies), MTAG elected to confine its evaluation to a few large programs selected as illustrative of the various mechanisms used by AID in fisheries assistance. MTAG chose examples that would provide a fairly representative sample, but not all program mechanisms used by AID are included here.

MTAG's evaluations were based primarily on information provided by AID from its internal files.¹ This information included reports by project personnel (filed both in mid-course and at the termination of the projects) and evaluations performed by teams of reviewers commissioned by AID. Constraints of time and money prevented MTAG from interviewing project staff or recipients in the field and precluded the gathering of primary data on impacts (although some anecdotal evidence was obtained from AID or project personnel). However, since these projects represented major AID commitments extending over long periods of time, numerous AID reports were available. Together, they were felt to provide sufficient detail for this report. The focus of this report is not the success or failure of particular projects but the broader issues of the match between AID's objectives in fisheries development programs and the mechanisms used to accomplish those objectives. MTAG considered the general directions of past AID fisheries assistance programs and the lessons that could be useful to the design and execution of future fisheries assistance.

Three programs were chosen by the MTAG Evaluation Team for detailed analysis: the first phase of the Fisheries Revitalization Program in the Republic of Korea between 1956 and 1964, and the Section 211(d) institutional-support grants awarded to the International Center for Marine Resources Development, of the University of Rhode Island, and the International Center for Aquaculture, of Auburn University. These three were chosen from among the many AID fisheries-related programs of the past two decades for the following reasons: availability of extensive documentary information regarding the programs; major AID financial commitments; long-term nature of the programs, which indicated continuing commitments by AID and provided some chance to assess retrospectively their output and impacts; and some differences in the ways in which these programs were administered, although two of the three were obviously similar.

The evaluations were the result of efforts by a five-person evaluation team drawn from the ranks of MTAG. Conclusions were reached through joint discussions and revision of drafts produced by individual

team members. A uniform format for the evaluations included the following elements:

Overview: derivation and history of the program and recipient institution or country.

Administration: program objectives, size of the program, administrative structure and specific project mechanisms used.

Accomplishments: program outputs, attainment of formal objectives, and impacts on development.

Qualifications: administrative difficulties, drawbacks to the mechanism, and unwarranted assumptions in design or execution.

Summary remarks: general comments, conclusions, and policy implications.

By focusing on a few large programs, the study undoubtedly ignores numerous small fisheries projects conducted by the AID missions without extensive oversight from headquarters in Washington. For these projects, documentation is limited and anecdotal evidence could be gathered only through extensive field interviewing, which was not possible for this project. The evaluation therefore does not convey an inclusive picture of total AID fisheries assistance. However, by focusing on the largest programs, the study covers the major portions of AID fisheries expenditures and those fisheries programs to which AID presumably attached a high priority.

Chapter 2 provides a general discussion of the policies and levels of funding for AID fisheries assistance programs. Chapter 3 is a detailed evaluation of the Korean Fisheries Revitalization Program. Chapter 4 evaluates the International Center for Aquaculture and the International Center for Marine Resources Development and discusses AID's institution-strengthening grants as a mechanism for fisheries assistance. Chapter 5 discusses other AID fisheries assistance mechanisms. Chapter 6 draws general conclusions about the mechanisms employed by AID in its past fisheries efforts and makes recommendations for future AID fisheries programs. Appendix A presents figures on past, present, and projected AID fisheries assistance. Appendix B contains brief summaries of a series of projects in India, a program conducted jointly with the East African Freshwater Fisheries Research Organization on Lake Victoria, a series of aquaculture projects in the Philippines, and the Guinean Trawling Survey conducted through a subunit of the Organization for African Unity. For these programs, AID was not able to provide MTAG with sufficient information for detailed evaluation. In the Philippine case, the project is ongoing and the final results cannot yet be ascertained. Appendix C is an inventory of AID fishery and aquaculture projects undertaken between 1969 and 1979.

CHAPTER 2

FISHERIES PROGRAMS WITHIN THE AGENCY FOR INTERNATIONAL DEVELOPMENT

Over the past three decades, it has become clear that the population of developing countries is growing faster than traditional agricultural production can be expanded to meet needs for food. Marine and freshwater fisheries increasingly have been recognized as an important means for augmenting food supplies for developing countries as well as providing a source of foreign exchange and enhanced income for local fishermen. Thus, fisheries development has become an important component of technical assistance efforts in developing countries. Since the early 1950s, the United Nations has been the major supplier of fisheries assistance. Other important suppliers include the United States, Japan, Canada, and European nations with long fishing traditions, such as Norway and the United Kingdom. United Nations fisheries experts have typically been drawn from the United States, Canada, the United Kingdom, and countries of Northern Europe.

Formal U.S. fisheries programs date back to efforts by the International Cooperation Administration during the early 1950s.² Since then, U.S. fisheries assistance has waxed and waned as a function of both overall foreign assistance policies and particular events within the fisheries sector. U.S. foreign assistance objectives since World War II have evolved from a desire to see countries modernize through infrastructure development and capital investment, to primary emphasis on enhancement of food production, to the recent emphasis on improving the lot of the poorest people in developing countries.³ The United States has provided strong support to international assistance agencies, some of which include fisheries in their programs.

In the early postwar years, fisheries were a significant component of U.S. food-related assistance, as evidenced by large programs in India and Korea and smaller activities in certain Mediterranean and Latin American countries. During this phase, roughly from 1950 to 1964, the International Cooperation Administration (and later AID) mounted a few large-scale fisheries assistance programs aimed at developing commercial fisheries employing fairly large fishing vessels and sophisticated infrastructure. The objective of these capital-intensive programs was to nurture local commercial fisheries, usually geared to export markets, particularly in countries with the potential

for rapid industrial growth. One such program in Korea seems to have been particularly successful because of a number of unusual circumstances, including the devastation of war and the willingness of the Korean government to support revitalization of the industry. On the other hand, a concurrent program in India yielded few immediate results, although India's recent emergence as a major fish exporter may be related at least in part to U.S. assistance.

In the second phase of U.S. fisheries assistance, roughly corresponding to the decade 1965-75, AID began to focus on the basic needs of the rural majority in most developing countries. Increased production of food for domestic consumption became the keynote of AID policy, but fisheries activity dropped considerably. Instead, emphasis was placed on rural development and improving the yields of basic farm crops, cereals in particular. Fisheries, especially capital-intensive commercial fleets, were seen as competitive with agriculture and inconsistent with a distributive approach that stressed equitable growth. The "new directions" policy imposed upon AID by Congress in 1973 reinforced this approach by requiring that assistance be directed primarily to enhance the productivity and income of the rural poor. Fisheries were downplayed also because of the uncertainty of the law of the sea negotiations and the expanded jurisdictional claims being made by coastal developing countries. Consequently, there was only sporadic AID support for large-scale industrial fisheries programs. Most fisheries assistance during this period consisted of ad hoc responses to requests for equipment or technical help, or small components of larger, essentially agricultural programs.

One major U.S. effort was mounted during this period to develop fish protein concentrate (FPC) through a multimillion-dollar research, development, and demonstration program. Although the program was initiated in the Bureau of Commercial Fisheries, which carried out most of the laboratory work and received most of the incremental funding, AID was designated as the lead agency. The program was based on the assumption that the introduction of a few grams of FPC per day into the diets of undernourished people could eliminate protein malnutrition. FPC was thus considered both a powerful weapon in the war on hunger and a technological solution to the problems of using abundant but unexploited fish stocks and distributing them worldwide. Although FPC was not a new idea (it had been experimented with in other countries and even tested as a dietary component in several), the scale of the U.S. program and the promise of the technical research stimulated new projects in many parts of the world. Despite the substantial resources committed, the U.S. FPC program failed in practice because of unrealistic expectations and political factors that have been thoroughly explored elsewhere.⁴ In fact, FPC is a useful nutritional additive and lately there has been a resurgence of interest in FPC-like materials.

The FPC experience had very strong adverse effects on AID's fishery efforts. It tended to discredit fisheries and fishery experts in the

eyes of AID managers and, to some extent, of Congress. AID became wary of undertaking any new large-scale fisheries programs. Instead, the agency chose to deal with problems of world hunger primarily through agriculture. Nutrition experts concluded that in most cases, protein malnutrition results from inadequate food intake and is not independent of caloric malnutrition as had been previously believed. Thus, belief in the value of fish as a high-protein food component was diminished.

This second phase of U.S. fisheries assistance also coincided with a notable rise in U.N. fisheries activities. These activities mainly involved the Food and Agriculture Organization of the United Nations (FAO) as the executing agency, with financing through the United Nations Development Programme (UNDP) and the United Nations Children's Fund (UNICEF). Projects were widely spread throughout the developing world and included activities such as stock assessment, training, infrastructure development, FPC commercialization (pilot plants), and construction of fisheries research vessels. Some U.N. programs were quite large and were mounted on a long-term basis with involvement of experts from many nations as well as strong in-country participation. Many U.S. fisheries personnel were seconded to these U.N. programs. Moreover, there was some sentiment within the U.S. foreign assistance community that fisheries development should be left to the U.N. while the United States concentrated instead on agricultural development, where we had expertise not available from other donor countries.

Since the early 1970s, AID and the multilateral development banks have expressed renewed interest in fisheries. Since 1975, the resources committed to fisheries programs by AID have increased substantially. During the five-year period 1970-74, AID initiated only seven new fisheries projects totaling \$8 million.⁵ In contrast, during the following five years, AID initiated 23 new projects in fisheries and aquaculture funded at a level of \$53.7 million in grants and loans. In 1980, two other large projects totaling \$3.3 million were begun. Also during the 1975-79 period, three NOAA fisheries experts were seconded to AID on an advisory services contract under the authority of the 1967 General Agreement between AID and the Department of Commerce. As of September 1980, there were 14 projects in fisheries and aquaculture funded by the Development Support Bureau, including core support for ICLARM, the Title XII strengthening grants, and Collaborative Research Support Program (CRSP) projects. Seventeen additional projects were funded by the Regional Bureaus and Country Missions. Most of these projects are in Southeast Asia and Latin America, but the largest single project is in Egypt (\$24 million from Economic Support Funds).

Despite this increase, fisheries remains a small part of the AID budget. For FY 81, the AID Development Support Bureau's Agricultural Office included requests for \$2.3 million for fisheries and aquaculture, or about 5 percent of the total budget request of \$50.2 million. Fisheries programs requested through the Regional Bureaus during FY 81 amounted to roughly \$9 million, or less than 1 percent of the total \$1 billion budget.⁶

AID's renewed emphasis on fisheries stemmed from a variety of factors, including heightened world interest in marine resources; U.S. congressional interest in fisheries, as evidenced by the specific inclusion of fisheries in the Title XII amendment to the Foreign Assistance Act; developing countries' requests to assistance agencies for marine-related services; and a reawakened interest among scientists, technologists, and agricultural economists in aquaculture as a food production system. This last factor has stimulated AID efforts in aquaculture because it coincides (at least theoretically) with the emphasis on smaller-scale projects of direct benefit to the rural and poorest segments of recipient countries. However, the enormous differences in catch between capture fisheries and aquaculture (the former account for about 96 percent of current world fish production) cannot be ignored, and some marine capture fisheries projects are also currently under way (e.g., Egypt's fisheries projects in the Red Sea).

Another factor contributing to the renaissance of fisheries within AID is the Board for International Food and Agriculture Development (BIFAD) created in 1975 by the Title XII amendment to the Foreign Assistance Act. The Title XII amendment requires that, within the guidelines of the "new directions" mandate, AID use more extensively and effectively the resources of the land-grant and Sea Grant institutions in carrying out foreign assistance programs related to food and nutrition. BIFAD's terms of reference include fisheries and aquaculture as food production methods. Sea Grant institutions are represented through NOAA on BIFAD's principal committees. BIFAD's resources include the institution-strengthening grants--successors to grants provided under Section 211(d) of the Foreign Assistance Act of 1961, as amended--which in FY 80 totaled 64 grants amounting to \$8 million. BIFAD also oversees the Collaborative Research Support Program (CRSP), for which \$1.75 million over two years was requested in FY 81. One of the nine priority areas in CRSP is fisheries and aquaculture, although most support went to agriculture. A seven-member Consortium for International Fisheries and Aquacultural Development has been established to provide leadership in setting up CRSP projects in fisheries and aquaculture. Consequently, fisheries has been formally recognized by AID as one means to improve the nutrition and income of the rural poor.

AID fisheries assistance has been administered differently during these three phases. During the first phase, the AID office responsible for fisheries assistance was called the Office of Agriculture and Fisheries within the Technical Assistance Bureau, which became the Development Support Bureau in 1977. Late in the second phase (1973), "fisheries" was dropped from the title of the office. A Division of Fisheries was established in 1976 within the Technical Assistance Bureau's Office of Agriculture. In 1980 a reorganization within the Office of Agriculture placed fisheries/aquaculture personnel as well as agricultural personnel in a Renewable Natural Resources Management Division, one of four new divisions within the Office of Agriculture.

In 1981 the Development Support Bureau was reorganized into the Science and Technology Bureau, consisting of four directorates. As of August 1981, organization of specific offices under the four directorates remained to be done.

CHAPTER 3

EVALUATION OF THE KOREAN FISHERIES REVITALIZATION PROGRAM

OVERVIEW

From 1910 until the end of World War II, Korea was a territorial administration of Japan. The Korean fishing industry during that period was organized and regulated along Japanese lines with the assistance of Japanese capital and technology. Japanese fisheries administration was designed to protect small Korean coastal fisheries by closing certain fishing areas to trawlers from other Japanese territories.

Korea was a major fishing country prior to World War II. According to FAO statistics, the 1938 Korean fish catch was 1.77 million metric tons, making Korea the third-ranked fishing nation in the world after Japan and the United States. The principal component of this catch was the Japanese sardine taken by Korean and Japanese purse seiners off the northeast coast of Korea. In 1938 more than a million metric tons were taken from this stock, but by 1943 the catch had fallen to zero. Korean fisheries prior to World War II were largely coastal and nearshore (in the Northwest Pacific), for domestic use (Korea and Japan), labor intensive, and seasonal. Though providing a major local source of food, Korean fishermen generally occupied a low social status in their predominantly rural communities.

After the Korean war, various conditions prevailing in Korea combined to shape the extensive fisheries assistance programs conducted first by the United Nations and then continued by the United States. During and immediately after the war years, there occurred a fundamental redistribution of population in Korea, with a large influx of immigrants to the basically agrarian southern half of the peninsula. As a result of this migration, there was a decrease in available agricultural land in the South, accompanied by increased urbanization and Republic of Korea (ROK) government emphasis on industrialization. Together, these factors created food shortages and a potential market for new fish products.

The fishing industry was marked at this time by inactivity and damage resulting from the war. Further, the industry was hampered by

high taxation of fish products, poor credit arrangements, and outdated fisheries laws. A scientific infrastructure in fisheries existed, but its activities were negligible. Officials in Korean government agencies concerned with fisheries were poorly trained and were often appointed through political patronage.

Since 1951, however, United Nations relief agencies had been operating fisheries assistance programs in Korea. Many of the personnel in these programs were U.S. citizens who later directed the U.S. efforts. Substantial amounts of money, material, and boats had been delivered by the U.N. and were on hand at the initiation of the U.S. assistance program in 1956. Most important, the United States had put a high political priority on furthering ROK economic development. After the change of ROK governments in 1960, Korea made a strong commitment to fisheries development, which permitted drastic changes in fisheries policy and administration and enhanced the cooperation and coordination of government agencies concerned with fisheries.

ADMINISTRATION

In this context, the United States in 1956 initiated major technical and financial assistance to the Korean fisheries sector. MTAG examined the first phase of this program, covering the period 1956-64.⁷ The objective of this program was the revitalization of the Korean fisheries industry in the broadest terms. Effective use of Korean fisheries resources was sought in order to provide increased animal protein supplies for the Korean people and to provide foreign exchange through export of marine products.

The Korean program was administered entirely as an AID program using U.S. fisheries experts as temporary consultants. These advisers all had practical fisheries experience, and most of them also had experience as fisheries advisers in developing countries. A separate Fisheries Branch was established within the local USAID mission to manage the various component projects. A wide-ranging, integrated approach was used in this program in order to address all aspects of the local fishing industry that required assistance, from capture through marketing and distribution. U.S. private investment in ROK fisheries was encouraged, including participation in the development of a distant-water tuna fleet. The cooperation of U.S. Army contingents stationed in Korea was enlisted to provide markets for the new fisheries products and training grounds for Korean enterprises in meeting the sanitation standards of an export market.

The operational objectives of the program included the following elements:

- Modernization of existing fishing gear, introduction and demonstration of new gear and methods, and improvement of fishing technology.

- Provision of materials and expertise for fishing boat construction, renovation of existing boats in the ROK, and supply of new vessels from overseas.
- Better use of known resources and exploration for new resources in coastal, offshore, and distant waters.
- Improvement of handling and preservation of catch both on vessels and at points of landing; improvement of processing through introduction of new equipment, technology, and standards.
- Improvement of distribution and marketing procedures, including new market facilities at landing points.
- Removal of impediments to development of the fishing industry through measures such as credit and loan programs, revised fisheries legislation, new taxation and customs procedures, and assistance to local fishing organizations, especially Korean cooperatives.
- Advice on reorganization of Korean government fisheries administration.
- Development of freshwater fisheries, including freshwater aquaculture.
- Training of Koreans in all aspects of the fishing industry, including diesel engine mechanics, boat construction and maintenance, and science and technology. Training took place in Korea, in the United States, and in other fishing nations of the region (Japan and the Philippines).

ACCOMPLISHMENTS

The Korean Fisheries Revitalization Program resulted in a modernized and efficient Korean fishing industry. During the eight years of Phase I, the program rehabilitated existing fleets and added new vessels, introduced new fishing methods and equipment, assisted in the better use of known resources, and helped expand the fishing grounds and the range of species exploited from the inshore zone to distant-water areas. U.S. efforts during and after this period appear to have been a principal factor in the subsequent development of the ROK as a major world fishing nation. In 1978, the ROK had a fish catch of 2.35 million metric tons (eighth in the world) and an export trade in fish products worth about US\$639 million (third in the world). In addition to export products, the Korean domestic fish consumption has resumed the level reached during the years before World War II. Although the Korean diet is generally low in animal protein because of a lack of meat supplies, fish now provides the largest source of animal protein

in the diet. This situation seems reasonable evidence of the success of the U.S. assistance program. Although other development assistance agencies were active in Korea before, during, and after the U.S. effort, the U.S. program was by far the largest and most comprehensive.

QUALIFICATIONS

The overall objectives of the U.S. assistance program in Korea were largely accomplished. Despite this apparent success, several drawbacks should be noted that could affect the application of this model to different recipient contexts.

- The U.S. program focused initially on provision of new offshore vessels and gear and principal landing port facilities rather than on existing nearshore fisheries. Improvements of gear and methods in the nearshore/coastal fisheries (artisanal and small-scale) apparently were delayed until considerably after those in offshore and high seas fisheries.
- New fishing vessels and equipment that were supplied by the U.S. program in some cases had already arrived in Korea through U.N. sources but were awaiting distribution; in other cases the supply of new vessels (e.g., for the tuna and other high seas fleets) were supplied through arrangements resulting from a Franco-Italian agreement in 1962 to finance new Korean fishing vessels. In other words, without the vessels already on hand and financed by other agencies, the U.S. program would not have attained such immediate results.
- Processing and preservation of fish products was greatly improved but targeted for the export market; it is not known whether such improvements were simultaneously achieved in domestic ROK markets.
- Although important demonstrations of distribution and marketing procedures took place at several major centers, it is difficult to judge whether a national integrated distribution and marketing system emerged beyond the major fishing ports as a result of the program.
- It was only after the change of government in 1960 that officials at the highest levels of the Korean government became receptive to the removal of institutional barriers to fisheries development, as suggested previously by U.S. advisers, and gave priority to development of a national fisheries policy. Before that political change, the U.S. advisers had not received local cooperation and were not achieving much success.

- Although there was an initial effort in freshwater fisheries, including freshwater aquaculture, this emphasis was not sustained.
- Initially, there appeared to be a lack of involvement of local academic institutions in aspects of fisheries research and management; this was probably detrimental to the speed and quality of the development program.

SUMMARY REMARKS

The elegance of the Korean fisheries assistance program was in its timing and in knowing when and where to intervene. It is a case in which a small capital outlay (\$4 million) produced a great benefit in the rebuilding, expansion, and modernization of an important sector of a developing country's economy.

This assistance program is one of the first examples of an integrated approach, ranging from capture to marketing, to the development of a fishing industry in a developing country. The program used a wide-ranging and flexible approach that could adapt readily to changing conditions both in Korea and in distant-water fisheries.⁸ Some of the initial projects pointed out new opportunities that became subsequent program objectives; for example, exploratory fishing for new stocks led to later exploitation of those stocks. These evolving objectives narrowed the program focus somewhat (e.g., away from aquaculture) but produced long-term industrial growth as well as immediate economic results through increased catches. These visible benefits may have played an important role in the incoming government's support of fisheries after 1960.

The U.S. assistance program benefited greatly from the enthusiastic involvement of Korean fishermen and fisheries industries personnel who saw the process as advantageous to them. This was partly a result of the willingness of the fishing experts hired by AID to work on the fishing boats and the fact that they were able to gain the respect of the fishermen. These factors were important reasons for the ready acceptance of new technologies and changes in fishing patterns.

There were several important characteristics of the Korean case which influenced the outcome of the fisheries program:

- Geography - There were abundant marine resources within close proximity. Korea is a peninsular country in which the marine environment always has played a key role in local society and culture.
- Diet - Fish products historically had constituted a major part of the animal protein available to the Korean population.

- Geopolitics - After the Korean War, the reconstruction and modernization of the Korean economy was a high priority for the U.S. government. In addition, a large U.S. military presence provided a market for high-quality Korean marine products. The reconstruction of Korea was viewed as a potential "showcase" of what U.S. assistance could do for a developing country. This U.S. commitment provided a basis for Korean competition with neighboring fishing countries.
- Fishing Industry - A fishing industry existed prior to U.S. assistance efforts. The United States was able to build upon an existing infrastructure, including research and extension stations, and government agencies that were, like the industry itself, in need of rebuilding and revitalization. Korean fishermen and industry personnel were receptive to new methods and willing to change old ways to improve their own economic situation.
- ROK Commitment - There was a major commitment to fishery development by the ROK government, particularly following the replacement of the Rhee government in 1960.
- Administrative Structures - An organizational and legal structure, although somewhat antiquated, was already in place. In other words, the Koreans had been introduced to a regulated system of fisheries management. Substantial changes sometimes were required in these systems, but this probably presented fewer problems than if the United States had attempted to create new systems.
- Timing - In the aftermath of a war that had partitioned the country and destroyed or damaged much of Korea's socioeconomic infrastructure, the United States was able to stimulate change within a fluid situation.
- International Cooperation - Korean development was not solely the concern of the United States. Rather, U.S. assistance was provided alongside substantial aid commitments by other nations and multilateral agencies before, during, and after the U.S. assistance effort. The United States initiated its assistance program at a time when many of the needed materials had already been provided by the United Nations relief effort, and the United States facilitated the flow of this aid into Korean society.

The Korean experience gives rise to a number of general observations that have policy implications for future fisheries assistance by AID:

- Both donor and recipient countries need to make a firm commitment to fisheries development and recognize that many of the potential benefits are long-term.

- It is essential that the direct recipients of assistance see that the development activity has advantages for them and that they cooperate with the experts provided by AID. On the other hand, it is essential that the field experts be willing and able to communicate with the people receiving assistance and actually to work at the operational level. Technology transfer in this sense will succeed only if there is mutual respect and trust.
- AID projects need as far as possible to be complementary to, or coordinated with, other fisheries assistance programs (bilateral, multilateral) in the recipient country.
- There is need for long-term programs and follow-up of promising directions, including sustained technical support (fisheries experts) from AID headquarters to the country missions (the first phase of this program lasted eight years and was followed by another eight years' service by expert advisers). The quality and experience of the advisers and their ability to communicate with the people they are assisting at the technical and working level are most important.
- There is need for clearly defined goals implemented by experienced advisers. Regardless of size, fisheries programs should be broadly based and integrated even though the initial project addresses only limited aspects of the overall plan.

CHAPTER 4

AID GRANTS TO U.S. UNIVERSITIES

In 1966, the Foreign Assistance Act was amended to add Section 211(d), which permitted AID to fund U.S. educational and research institutions in order to "strengthen their capability to develop and carry out programs concerned with the economic and social development of less developed countries." The first grants under Section 211(d) were made in FY 68. By 1975, AID had made 54 such grants totaling nearly \$43 million to 45 universities. Section 211 was repealed by the International Development and Food Assistance Act of 1978 (Public Law 95-424, 92 Stat. 942). A function similar to Section 211(d) is now being played by institution-strengthening grants awarded to land-grant and Sea Grant institutions to promote international development activities. These grants are awarded under provisions of Title XII--Famine Prevention and Freedom From Hunger--which was added to the Foreign Assistance Act with the passage of the International Development and Food Assistance Act of 1975 (Public Law 94-161, 89 Stat. 849).

The primary objective of the 211(d) institutional support grants was to create multidisciplinary centers of excellence in areas relevant to AID's foreign assistance mission. Domestic institutions would thereby acquire expertise in addressing the problems of developing countries and would become increasingly experienced and involved in overseas activities. The 211(d) mechanism also implicitly addressed other AID objectives. By involving the academic community, AID could draw from a broad range of disciplines in attacking development problems. Active participation of academic experts could enhance the formulation and design of AID programs. Finally, AID could benefit from the research capabilities, communications networks, and institutional linkages within the U.S. academic community by maintaining close and regular contact with a few leading institutions in key fields.

In making the 211(d) awards, AID attempted to establish patterns of international linkages by making the creation of university consortia a condition of the grants. In practice, however, this often was not the case. Factors taken into consideration by AID in making awards to universities included (1) capabilities in disciplines and problem areas of concern to AID; (2) overseas experience, including training of

foreign students; and (3) previous experience working with AID. In practice, some of the initial Section 211(d) grants were made to replace or supplement existing AID arrangements with universities.

Two institutions were initially selected by AID to work in fisheries--Auburn University and the University of Rhode Island. Both universities established separate administrative units through which to manage the grants. The fisheries field was implicitly divided between the two grantees, with Auburn University responsible for inland fisheries and aquaculture and the University of Rhode Island responsible for marine resources, especially small-scale and artisanal marine capture fisheries.

THE INTERNATIONAL CENTER FOR MARINE RESOURCES DEVELOPMENT,
UNIVERSITY OF RHODE ISLAND

Overview

AID awarded a 211(d) grant to the University of Rhode Island (URI) in 1969 to strengthen the university's research, training, and service capacities in marine resources, especially fisheries, and to extend its capabilities into international development activities. Capabilities in a variety of disciplines (marine resource economics, marine biology, oceanography, ocean engineering, fisherman training, fishing gear research, food technology and marine extension work) were to be directed toward the problems of developing countries through the International Center for Marine Resources Development (ICMRD). In 1974, AID directed ICMRD to concentrate on small-scale fisheries development, to expand its advisory and information response services and to improve its linkages with other domestic and foreign institutions. Supplemental grants were awarded in 1974, 1975, and 1977. The initial grant to URI amounted to \$750,000 spread over five years, while later supplementary grants up to termination of the project at the end of 1979 totaled \$2.01 million.

AID support for ICMRD assistance-related activities, as distinct from core support, is difficult to distinguish in the documents available to MTAG. There appears to have been some additional project support from AID but not at a level sufficient to sustain much direct technical assistance to developing countries through the AID field missions. Some support was received from other sources, such as the National Science Foundation, the National Marine Fisheries Service, and later, a small grant from the Tinker Foundation. However, the level of such support also is difficult to ascertain.

A portion of the assistance-related activities of ICMRD occurred through projects executed by the Consortium for Development of Technology (CODOT). CODOT is a joint operation of food science and technology departments of five universities--University of Rhode Island, University of California (Davis), Michigan State University,

University of Washington, and the University of Wisconsin--and provides training and research assistance to foreign institutions in food-related areas. URI through ICMRD acted as the administrative unit for CODOT. It is unclear how much of CODOT development assistance activities were performed directly by URI or ICMRD staff, but it should be noted that fisheries technology was only one component of CODOT activities. However, AID specifically encouraged participation of 211(d) grantees in consortia like CODOT. Such involvement enlarged ICMRD international experience and provided access to a large inter-university network in one of the fields vital to fisheries in developing countries.

Administration

The mechanism used by URI to meet the objectives of the 211(d) grant was the International Center for Marine Resources Development, established as a separate unit within the Graduate School of Oceanography. Permanent appointments under 211(d) were limited to the ICMRD director and his small staff, who coordinated program activities by various faculty groups throughout the university. By this arrangement, faculty in marine-related disciplines were oriented by ICMRD toward marine resource problems of developing countries.

URI was expected to perform the following specific tasks:

- Recruit new staff with interest in the international dimensions of marine resources and foster similar interest among present faculty in various disciplines, with a particular focus on the socioeconomic aspects of fisheries development;
- Design and conduct a series of multidisciplinary studies on marine resources, especially fisheries, in developing countries (later with a particular emphasis on small-scale fisheries);
- Design and conduct seminars, courses, and workshops for degree and non-degree programs related to marine resources, food and nutrition, and developmental problems;
- Provide training to foreign and U.S. graduate students, administrators and researchers from developing countries, and personnel from U.S. private and governmental agencies, including AID;
- Provide advisory, technical, and extension services on marine resources in developing countries;
- Provide information services, including network development, information dissemination, and a library;

- Establish and maintain linkages to fisheries institutions in developing countries and to other national and international fisheries institutions.

Accomplishments

Because of limited resources, MTAG attempted no evaluation of the ultimate success of ICMRD's overseas field projects. However, AID evaluations over the period of the contract stated that ICMRD had largely met AID's expectations in the performance of its duties under the 211(d) grant. The ICMRD fostered a socioeconomic perspective on fisheries in developing countries. ICMRD activities were multi-disciplinary, even though the majority of studies it published were within a single discipline (resource economics). It developed an information service that responds to requests for assistance from both the United States and abroad. It made contacts abroad and held workshops in conjunction with colleagues from developing countries. ICMRD was responsive to the few specific AID requests for overseas field work it received and had frequent contact with AID headquarters in Washington. The program at the University of Rhode Island matched AID's new emphasis on the socioeconomic aspects of development.

Qualifications

Despite the overall success of the program, there are clusters of problems that hampered the functioning of the 211(d) mechanism as administered through ICMRD. Some of these problems were inherent in the mechanism itself, while others originated with the parties to the contract. The latter involve unclear or opposing assumptions about the nature of the mechanism and the associated responsibilities, and the ways in which personnel interpreted or executed the 211(d) contract.

- ICMRD's activities covered a wide range of research topics and disciplines, almost to the point of being too diffuse. Yet despite this multidisciplinary approach, most ICMRD studies up to 1973 were undertaken by the resource economics group.
- ICMRD did not have a staff or adjunct faculty of its own apart from the director and his administrative staff. It therefore acted more as an administrative clearinghouse than as a center of research and training. Under this arrangement, linkages to other university departments and other institutions are essential for attracting individuals and projects. Within the university, ICMRD's principal collaborators were located in the Department of Resource Economics. Moreover, ICMRD's linkage with the other 211(d) grantee (Auburn) was weak, and linkages with other U.S. universities, U.N. agencies, and developing country institutions appear to have been inadequate or nonexistent. AID could have been more helpful in

facilitating these linkages, particularly with its other 211(d) grantee.

- ICMRD concentrated its field activities in Central America; its activities elsewhere were limited to information services and a few conferences. It may not be justifiable to extrapolate results from Central America to other regions, especially those outside the tropics. Early work of ICMRD showed an apparent lack of perception of fisheries development problems in tropical countries outside Central America, as well as limited use of previous scientific work and results in those other areas.
- Some of ICMRD's problems also derive from management difficulties within the parent university, as evidenced by the rather frequent changes of ICMRD director.
- The selection of URI as the site of the business and administrative office of CODOT has led to some confusion in determining how many of CODOT's activities were actually performed by ICMRD staff. For administrative convenience, URI elected to place the CODOT office within the ICMRD structure, and this seems appropriate enough in view of the international orientation of both organizations. URI is only one member of CODOT, which in any case is concerned with food problems in general, rather than strictly fish products. But CODOT is important, as evidenced by the development of linkages between URI and other institutions, and by the participation by URI in overseas activities independently of 211(d) funding.
- It is difficult to determine from ICMRD reports to AID the number of foreign students and professionals receiving training under ICMRD auspices, as separate from URI totals. Most figures quoted are for the university as a whole.
- No special courses on needs of developing countries were established, although in many cases, faculty and student research projects were clearly related. Formal short-term training programs for personnel from developing countries were not established.
- Given the proposed socioeconomic thrust of ICMRD, problems of marketing and distribution were not sufficiently emphasized, and processing and preservation received attention only later. Despite AID's evolving program emphases and the 1974 mandate for ICMRD to focus on artisanal fisheries, there was little emphasis on problems affecting artisanal fishermen, such as income inequality, underemployment, or the role of women in development.
- Direct fisheries technology work done by ICMRD was minimal.

- Excluding a predominately agricultural project in the Azores, the promotion of extension services apparently was not emphasized.
- There is little convincing evidence that the numerous but scattered artisanal and small-scale fisheries in most developing countries are capable of taking advantage of the highly sophisticated socioeconomic models employed by ICMRD. It appears that ICMRD has not evaluated the applicability of these models, nor is it clear that simpler approaches were explored.
- AID did not clearly indicate to URI what substantive program development was expected. Thus, personnel at ICMRD pursued research of interest to themselves. Some of these interests did not match AID's, either at headquarters or in the field missions.
- AID did not indicate to URI its particular interests in small-scale marine fisheries. URI approached the problems of small-scale marine fisheries primarily from the standpoint of microeconomics. The independent faculty approach did not foster the type of multidisciplinary studies envisioned in the 211(d) grant program.
- In view of the predominance of artisanal and small-scale capture fisheries in the world fish catch and the multitude of problems in that sector, creation of only one center of excellence, ICMRD, was probably inadequate.
- AID anticipated that 211(d) grantees would receive additional support from AID and elsewhere. Indeed, some support was obtained (e.g., NSF, NMFS, Tinker Foundation, Saudi Arabia). However, in many cases ICMRD functioned as a managerial clearinghouse rather than carrying out assistance activities directly (e.g., CODOT business office).
- Certainly, long-term support was needed from AID if it wished URI students to work abroad in higher degree programs. Likewise, additional funding was necessary to underwrite assistance activities in areas more distant from the United States than Central America. AID failed to recognize that URI support for continued overseas activities by ICMRD would be minimal.
- Neither AID headquarters nor the country missions made use of ICMRD in policy formulation or field work. Given AID's lack of a policy for marine capture fisheries, it is unlikely that AID could have effectively used the capabilities assembled by ICMRD.

Summary Remarks

The approach followed by URI to meet the objectives of the 211(d) grant program was to focus the interest of existing faculty groups involved in marine activities on the fisheries problems of developing countries. The institutional mechanism for this was the ICMRD, which consisted principally of the director and a small administrative staff for organizing conferences and facilitating research and development programs by various faculty groups. While there was some broadening of interest and capability within the faculty as a result of the program, the most significant involvement from outside the marine-related departments at URI was from the Resource Economics faculty. Social scientists were involved in various aspects of the overseas fishery studies, which were later concentrated on Central America.

Projects developed around existing faculty interests without evidence of any strong cohesive plan from the central administration of ICMRD. This provided the opportunity for widespread faculty involvement in studies of fishery development problems and could have led to creation of a large pool of faculty experts to assist AID. But this potential was not realized. Informal linkages were established with experts outside URI through the participation of foreign experts in workshops and symposia and through the connections of participating URI faculty with colleagues in other institutions, but no formal networks were established.

One exception, however, was URI's participation in the Consortium for the Development of Technology. The housing of the CODOT office within ICMRD opened a rather large network involving four major U.S. universities besides URI. Faculty and staff from URI have been involved directly in overseas operations of CODOT, some of which have been concerned with fisheries and thus have extended the experience of these individuals. But it is important to recognize that the activities of CODOT managed by ICMRD from a business standpoint have been independent of 211(d) activity. Although there has been close coordination between such activities, e.g., in Central America, funding is separate and independent.

Although there was some increase in expertise and overseas activities among URI faculty, there is little evidence that ICMRD was capable of immediate response to AID requests for field services in fisheries. Moreover, AID made relatively little use of the capability developed by ICMRD. There was little overt interest in capture fisheries on the part of the AID Washington office or by the Country Missions, even though a number of the missions are situated in countries whose major supply of animal protein is derived from such fisheries (e.g., Indonesia, Philippines, Sri Lanka, Thailand). No clearly stated policy on marine fisheries was developed by the agency. The current concentration on artisanal and small-scale fisheries within AID was a consequence of the "new directions" policy, which focuses attention on the rural poor, among whom are included small-scale fishermen.

The URI Central American (Costa Rica and Guatemala) program in small-scale fisheries focused primarily on economics and marketing, although a technological component was introduced later. Thus, the URI research and development activity abroad has been aligned with recent AID goals even though little AID development activity has proceeded in this area.

AID-sponsored reviews of the URI program have generally concluded that it is meeting the 211(d) objectives. However, it is difficult to judge the accuracy of this conclusion since there has not been a significant AID demand for services by ICMRD. AID's review teams to evaluate ICMRD included only a few nongovernmental members and only a few members with extensive expertise in tropical fisheries.

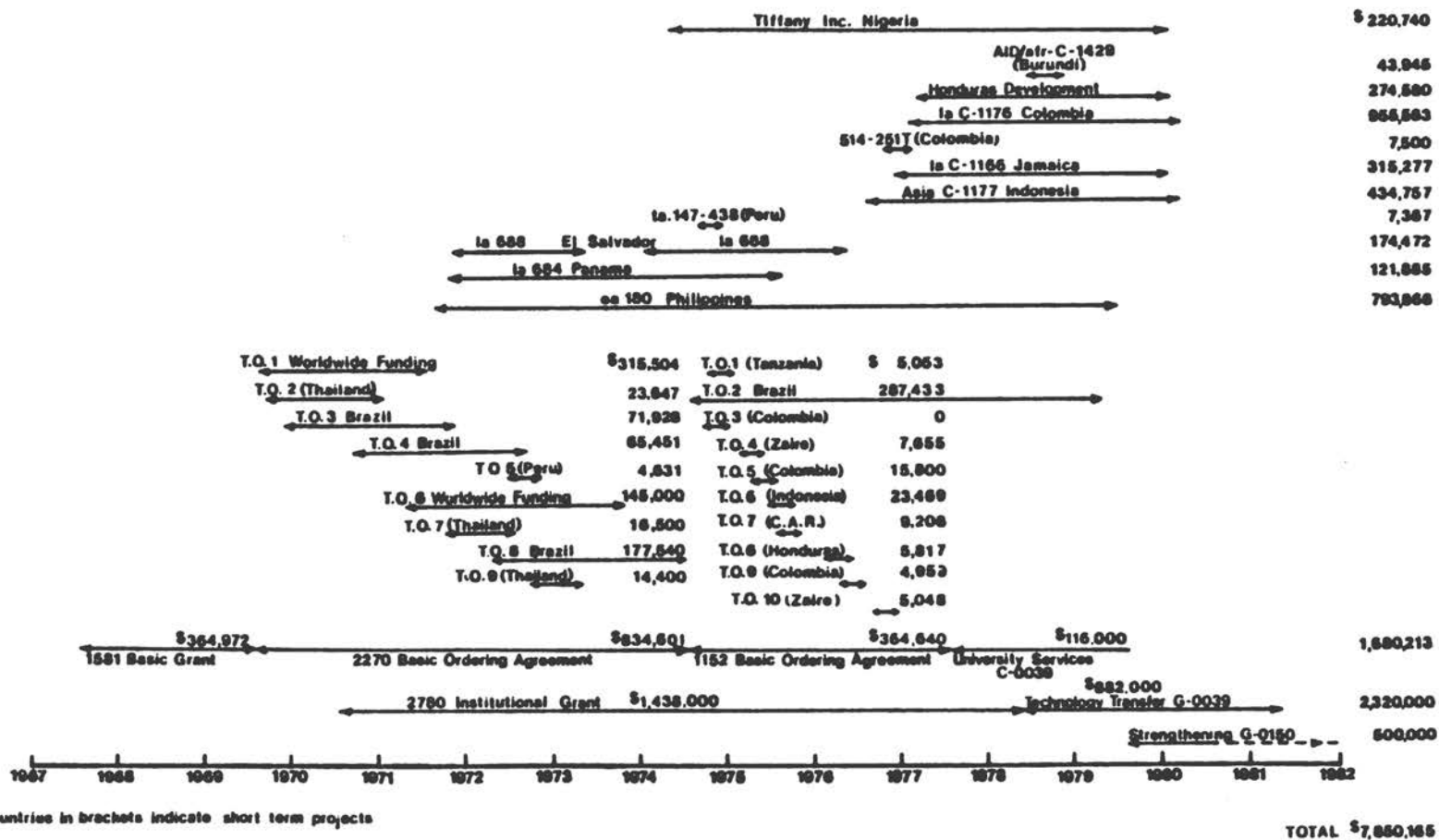
THE INTERNATIONAL CENTER FOR AQUACULTURE, AUBURN UNIVERSITY

Overview

Auburn University was chosen by AID for 211(d) institutional support in inland fisheries and aquaculture because of its technical capabilities and previous international development activities in aquaculture. Auburn therefore differed from the University of Rhode Island in that the 211(d) grant awarded in 1970 was only one component of a broad and continuing involvement with AID. In this respect Auburn was more typical of the 211(d) grantees in other fields who had extensive previous experience with AID in overseas operations.

Auburn's aquaculture development activities overseas were originally funded by the Rockefeller Foundation in 1965; AID funding began in 1967. The complexity of AID funding arrangements with Auburn before and during the period of the 211(d) grant are indicated in the following table. Various mechanisms were used by AID to provide Auburn both core support and funding for specific projects in developing countries. For example, before receiving the 211(d) grant, Auburn had executed surveys of fish culture potential in 32 countries (1581 Basic Grant) and had initiated long-term aquaculture projects in Thailand and Brazil (2270 Basic Ordering Agreement). The funding arrangements shifted with time, as evidenced by the change of core support from a Basic Ordering Agreement to the 211(d) grant and the subsequent 1978 shift of overseas advisory services from the 211(d) grant to the University Services Contract 0039. Furthermore, during the course of the 211(d) contract, Auburn was involved in a large number of extension activities funded under other AID contracts in various countries. At the expiration of the 211(d) grant in 1978, Auburn was awarded an aquaculture technology development grant (G-0039) for expanded information dissemination services as well as continuation of its other development services. Finally, a Title XII strengthening grant (G0150) awarded for a five-year period beginning in 1979 has provided funds for two additional faculty positions in economics and one in extension services.

TIME CHART OF INTERNATIONAL CONTRACTS
INTERNATIONAL CENTER FOR AQUACULTURE, AUBURN UNIVERSITY



SOURCE: Moss, D.D., J.H. Grover, H.R. Schmittou, E.W. Shell, and F.L. Lichtkoppler, "Auburn University's Philosophy and Strategy for International Aquacultural Development and Technology Transfer," Proceedings of the World Mariculture Society, Vol. 10 (1979), pp. 68-78.

Administration

The 211(d) grant awarded to Auburn was designed to continue and supplement ongoing overseas operations in aquaculture development. The objectives of the grant were to strengthen Auburn's capabilities in inland fisheries and aquaculture assistance and to provide more support for the International Center for Aquaculture (ICA). The latter was established by Auburn as a separate entity within the College of Agriculture. The initial grant placed special emphasis on research programs, information sources, and training of personnel in developing countries. The technology development grant that succeeded the 211(d) grant in 1978 stressed dissemination of information as well as continuation of training, development of staff capabilities, research and demonstration stations, and advisory services for on-site overseas projects. As mentioned above, the Title XII strengthening grant permitted the establishment of additional faculty positions in the ICA.

Auburn University was expected to perform the following tasks:

- Recruit and support faculty and staff for use at Auburn and overseas;
- Construct and operate research and demonstration stations and extension services at Auburn and overseas;
- Identify socioeconomic, biological, and climatological constraints on development of aquaculture and inland fisheries;
- Develop and maintain institutional linkages in the United States and overseas;
- Develop an information center including a library, information networks, and dissemination programs on matters related to aquaculture and inland fisheries;
- Develop research programs, including socioeconomic, critical analyses of the state of the art in aquaculture, and the suitability of freshwater species for adaptation to culture techniques;
- Develop training programs for graduate students as well as special non-degree programs for personnel from developing countries and U.S. agencies, foundations, and industry.

Accomplishments

It is the consensus of the evaluations conducted by AID that Auburn fulfilled the objectives outlined above. For example, the ICA developed facilities and staff of considerable expertise and became a recognized leader in world aquaculture. The ICA responded to numerous requests

for services from AID Country Missions and entered into numerous other contracts with AID for field work. A library of aquaculture materials was established and an increasing number of foreign students have studied at ICA. Research and demonstration stations and extension services have been established at Auburn and in developing countries. Extensive reports have clearly documented ICA activities. Finally, the ICA has conformed its activities to the changing priorities and objectives of AID.

Qualifications

The following problem areas were evident in the ICA's generally successful discharge of its responsibilities under the 211(d) grant. As in the program at URI, these problems derive from the inherent difficulties of universities operating as development agencies and from ambiguities and misunderstandings of the 211(d) agreement.

- AID did not have a coherent view of the potential role of aquaculture in development and of its relation to fisheries assistance. AID uncritically accepted the fundamental assumption that aquaculture could make an important and immediate contribution to alleviate world protein shortages.
- AID's stated objectives for the ICA were vague, diffuse, and general. During the course of the grant, congressional mandates substantially altered AID's criteria for program design and evaluation.
- AID assumed that Auburn would provide policy guidance to AID in aquaculture but did not make this expectation explicit. Auburn's responsiveness in meeting AID requests constrained its initiative with regard to policy issues as well as research relevant to the fundamental problems of tropical aquaculture.
- The institutional support grant was not intended to underwrite extensive ICA field operations. Such support was provided by other contractual arrangements with AID. Institutional support by Auburn was also necessary. These arrangements complicated administration and management (see table and text at p. 30-31).
- ICA interpreted its responsibility narrowly by focusing almost entirely on inland aquaculture to the exclusion of inland capture fisheries, brackish-water aquaculture, and the relationship between capture fisheries (both inland and marine) and developing countries' aquaculture potential and policy.

- There was little attention devoted to socioeconomic and other problems closely related to aquaculture--fish processing, preservation, marketing, and distribution.
- ICA made several assumptions about the potential for aquaculture ventures in developing countries, including the following:
 - availability of land for aquacultural use
 - lack of competition among various land uses
 - ease of integrating aquaculture with other agricultural and pastoral operations
 - absorption of the product by local markets and acceptance by consumers
 - receptivity of developing countries' decision makers to aquaculture
 - benefit of aquaculture to the poor
- ICA, Auburn, and AID share responsibility for a lack of feedback mechanisms to help identify and resolve problems.
- There was a lack of consistent institutional linkages, particularly with AID and the University of Rhode Island as the other marine 211(d) institution, but also with industry, other U.S. governmental agencies, and international agencies (UNDP, FAO).
- Hiring for ICA was largely confined to Auburn graduates or staff. There was little apparent effort to bring in outside people, nor was there much external contact with outside aquaculture experts, either domestic or foreign.
- ICA demonstration and research sites in the United States were located in a temperate region, even though the target was warm-water fisheries. No apparent attempt was made to simulate tropical conditions through artificial environments, or to diversify the species used in aquaculture projects.

Summary Remarks

Lacking aquacultural expertise except through a seconding arrangement with NOAA's National Marine Fisheries Service, AID came to depend more and more heavily on Auburn to implement its aquaculture programs. Aquaculture has a strong attraction among AID food and nutrition staffs, who are primarily agricultural experts. On the other hand, marine fisheries, which involve capture rather than husbandry, are neither well understood nor supported by AID staff. Auburn itself appears to have come to aquaculture by a land-based agricultural route, restricting its interest to pond culture in inland rather than coastal settings.

In responding to AID, Auburn assembled a tightly knit group of aquaculture experts with impressive technical and practical expertise, but who operated primarily in a rather narrow field defined as warm-water aquaculture. This group seemed to operate to a large extent independently of the rest of the university and indeed received little or no financial support from the university. The ICA thus became virtually an AID unit within the university and, perhaps not unexpectedly, as a result tended to operate primarily in response to AID requests and suggestions without apparent consideration of its role as a component of Auburn University. In addition, it is not clear what effect, if any, the Auburn group had in the evolution of AID policy on aquaculture (even though ICA executed many field projects for AID). The ICA seemed to be concerned primarily with supporting AID field programs on an ad hoc basis and with improving and to some extent adapting known techniques for the culture of particular warm-water fishes such as tilapia and carp. There was little truly innovative work in the more fundamental aspects of aquaculture, such as reproduction, nutrition, genetics, or disease. In addition there seems to have been little effort to identify more suitable culture fishes within the countries in which project teams worked. Nonetheless, there is no question that the group did develop strong expertise in the culture of certain fishes and was able and willing to transmit this knowledge to developing countries through training of individuals and construction of demonstration and broodstock ponds.

The fact that this did not result in widespread development of farmpond systems may have been due in part to the failure of Auburn to develop capability in socioeconomic fields. ICA activities were essentially one-dimensional and pertained almost exclusively to the technology of pond fish farming. Although AID review teams periodically criticized the lack of a socioeconomic component in the Auburn program, the agency should have insisted that such capability be included on Auburn project teams.

A broader continuing problem seems to have arisen as a result of the isolation of ICA within the university. This involved an institutional introspection, which caused the group to develop centripetally. It greatly hindered the establishment of linkages with other scientific groups working in aquaculture, causing the ICA programs to function within narrow limits. Presumably the establishment of centers of excellence at universities was intended to provide AID with both specific expertise and easy access to a broad range of disciplines and institutions linked through a core institution knowledgeable about the subject area. In addition, AID presumed that centers of excellence, because they would be situated in universities, would have easy and continuing access through professional networks with other sources of information and expertise. At Auburn, AID got a highly focused, strongly motivated and, within their purview, highly effective technical support group. However, in most activities this group chose to remain somewhat insulated from the usual academic and industrial information networks. It is important to determine whether this

isolation was primarily a consequence of Auburn's policies, AID's policies, or the lack of a policy. There is some reason to think that it was because of the lack of a policy. ICA grew independently as an AID adjunct, fueled by AID grants and contracts and busily meeting fairly detailed and often changing AID requirements in its overseas operations.

Again it should be noted that the situation arose in large measure because of Auburn's zeal in meeting AID requirements as Auburn perceived them. This committed the time and effort of the major Auburn participants quite fully to day-to-day business and apparently left little time or opportunity for long-range planning and university program development. AID for its part was concerned primarily that the needs of its country and regional missions were being satisfied and was also perhaps reluctant to interfere directly with internal university arrangements. Clearly a stronger direct commitment by the university to the ICA and its program would have eased the situation. This might have been facilitated by a stronger expression of interest by AID in the total university involvement.

PROBLEMS IN THE 211(d) MECHANISM

Three problems inherent in the 211(d) mechanism emerged: unclear and inconsistent sponsor expectations, institutional isolation, and the need for continuing AID support. First, AID did not define with precision what is wanted from the grantee institutions because it felt that the exact nature of the programs should be determined by the academic experts themselves. Moreover, the recipient institution expected substantial latitude in designing programs; AID apparently expected assistance from the recipient institutions in defining its fisheries policy but never formally requested or used them in this capacity. ICA was called upon regularly to provide short-term advisers and services for AID, while ICMRD generally was not. With the passage of the Foreign Assistance Act of 1973 (Public Law 93-189, 87 Stat. 714), which established the so-called new directions policy, AID grant-renewal reviews suggested that both programs be focused on activities more consistent with AID's new priorities namely, emphasis on assistance that directly benefits the poorest people in recipient countries. Both recipients responded well to specific AID requests for services, but neither initially displayed much leadership in suggesting new approaches to AID in their respective fields of expertise. The 211(d) mechanism appears to require a delicate balance between AID direction and recipient initiative. Substantial latitude must be given to the recipient institutions during their formative years, but the sponsor must also clearly define the type of expertise sought and the means by which this expertise will be applied to AID field operations.

A second problem for university components created to perform applied developmental tasks for AID is isolation, both intra-institutional and inter-institutional. The former problem was

particularly evident in Auburn's program, the narrow technical focus of which did not conform to the multidisciplinary approach mandated by AID.⁹ Such intra-institutional isolation reflects an inherent tension between universities and operational agencies like AID. By attempting to tap into the flow of ideas within the academic community through a "captured" unit of the university, AID may exacerbate this unit's isolation (by virtue of its different orientation and funding source) from the remainder of the university. AID correctly perceived that linkages to other similar institutions are critical to maintaining the effectiveness of such development-assistance units. However, formal linkages with other institutions were consistently neglected by the recipient universities, although extensive formal contacts were established. Linkages with overseas institutions tended to be sporadic and formal. Despite repeated recommendations in its program reviews, AID must bear partial responsibility for failing to prod or assist the recipients sufficiently to achieve the desired linkages. Linkages with developing country institutions should be an essential part of future core support programs.

Third, the issue of continuing sponsor support has remained unresolved within AID. After creating institutions with valuable expertise and overseas experience, AID must provide core support to maintain that expertise as well as supplementary funding to use it in field operations. AID program evaluations have unanimously concluded that ICA and ICMRD would founder without continued AID support. State legislatures are unlikely to fund international development assistance activities, and university administrators generally do not see such programs as part of the educational or research missions of the universities.

Fisheries-Specific Problems

During the initial period of these grants, fisheries aid received a very low priority within AID. This began to be reversed in 1975. AID goals for enhancing food supplies from 1965 to 1975 were basically agriculture-oriented, reflecting the training and experience of mid-level and senior AID officials. Not surprisingly, aquaculture received a higher AID priority than capture fisheries because of its association with, and similarity to, agricultural operations. Because of this, the ICA program was more heavily used and promoted by AID than the ICMRD program for capture fisheries. This relative imbalance in AID priorities persisted, though marine fisheries began receiving more attention after the 1974 midterm reviews. This reorientation was part of a more general recognition of the importance of small-scale fisheries, as a result of the "new directions" policy. Linkages with other organizations, in the United States and abroad, having major programs in these fields did not receive adequate attention from the 211(d) recipients.

Policy Implications

MTAG's evaluation of the two 211(d) grants in fisheries suggests several critical issues in designing future fisheries assistance programs involving U.S. universities. First, proper use of domestic centers of excellence in fisheries or aquaculture would seem to be enhanced by a coherent AID fisheries policy developed by fisheries experts. This is not to say that fisheries should necessarily be a high AID priority, but that major expenditure on fisheries programs should follow from a coherent fisheries strategy. AID should not have to rely on contracting institutions or consultants for its policy direction. The AID administrative structure should recognize fisheries as a commercial food-production activity separate from agriculture.

Second, AID must address the basic issue of whether to establish university-based centers of excellence as a principal mechanism for providing fisheries assistance to developing countries. There is an apparent trade-off in maintaining quick-response, foreign-assistance units within the university rather than encouraging broad involvement and introduction of ideas by university personnel. Financial support to university-based fisheries centers must necessarily be substantial and open-ended. Indefinite support will be required both to maintain the necessary level of expertise and to use it in field operations. Given the expense of supporting 211(d) institutions, AID may wish to explore other mechanisms (consortia, ad hoc groups of experts, service contracts, or nongovernmental organizations specializing in fisheries) for fisheries assistance. Moreover, core support appears to reduce somewhat AID's flexibility in using other assistance mechanisms. The two 211(d) grants consumed a large portion of the small AID budget for fisheries, especially during the first five years of the grants when AID fisheries interest was at a low ebb. For example, nearly all the AID-funded aquaculture projects during that period were executed by Auburn. While gaining a "captured" institution and staff, AID may sacrifice a broader network of contacts within the academic community.

Closely related to this issue is the adequacy of AID's using only two institutions in the fisheries field. Although Auburn appeared to be well structured to handle the aquaculture projects requested by AID field missions, URI's responsibilities were much broader. It is doubtful that one university-based program could have successfully handled all the requests to AID for assistance in capture fisheries, especially given ICMRD's nature as a coordinating unit with a very small staff. The imbalance in global production between capture fisheries and aquaculture hardly seems to justify the approximately equal division of AID resources. Although the aquaculture services are in increasing demand, this emphasis on aquaculture would not seem justified for some time to come. Moreover, increasing demand for all types of fisheries assistance would clearly justify a number of fisheries assistance institutions. In light of the funding levels required for this assistance, AID may wish to acquire access to a number of U.S. institutions without committing the major portion of its resources for fisheries to a few universities.

Third, to use the 211(d) mechanism effectively requires a thorough understanding of objectives and responsibilities by both parties to the contract. Although the research and institution-building aspects of these grants necessitate considerable latitude, the 211(d) mechanism was not conceived as a carte blanche to universities. AID must ensure that the recipients are guided toward useful products meeting AID needs.

AID assembled impressive pools of expertise at these universities, but apparently had given little thought to the question of how to use this talent in fisheries projects. This was less a problem for Auburn, which had a more focused program and a history of contacts with AID field missions and developing country governments. Core support agreements such as these would seem to require a clear understanding of the capabilities and limitations of universities as development assistance agents, e.g., the problem of freeing large numbers of university faculty for simultaneous overseas assignments. AID should have a clear concept of how it intends to use the staff of grantee institutions and must ensure that they are in fact used by AID's operating bureaus. Vagueness and ambiguity in the grant terms contributed to many of the problems encountered in these arrangements.

Fourth, AID required institutional linkages, both domestic and international, as a condition of past 211(d) grants, but should provide more active assistance in creating those linkages in future fisheries grants. This would include linkages to other fisheries organizations, to potential clients within AID--central bureaus, regional bureaus, and country missions--and to potential clients abroad. Naturally, the primary responsibility lies with the contracting university, but AID could devote more attention to these linkages. AID rarely took the initiative to bring its 211(d) fisheries institutions together for an exchange of views, division of labor, or input into AID policymaking.

Finally, fisheries centers should be structured to maintain broad programs that are both geographically and functionally diverse. The former implies field activities not concentrated within particular countries or regions. Projects should be designed with a view toward applicability in other developing countries and other regions. With their limited resources, the 211(d) grantees should perhaps stress regional projects, as these potentially benefit multiple recipient countries. This implies a multidisciplinary approach to fisheries development problems in which a broad range of services are available to meet requests of recipient countries.

CHAPTER 5

OTHER MECHANISMS FOR FISHERIES ASSISTANCE

The three major programs reviewed above exemplify either direct AID management or university-shared management of programs. Some additional project mechanisms described in Appendix B have been used with varying success. For example, AID has operated as a minor or complementary player in projects managed by international agencies. This was the case in the initial stages of the Korean program before 1956. Conversely, the United States was initially a major player in Indian fisheries development during the late 1950s but later scaled back its efforts and was largely replaced by other donors (Appendix B.1). In subsequent cases such as East Africa, joint or complementary efforts with other donors apparently have worked well. However, success in these programs must be measured against the international agency's objectives, which may or may not coincide with U.S. aims. Assistance through international agencies must always involve a trade-off between smaller U.S. expenditures and reduced U.S. control of the program--a good bargain in some cases and a disaster in others.

Minor involvement in recipient government-funded activities is another mechanism that has been used by AID in fisheries assistance. This most commonly involves providing U.S. university or private expertise, paying other costs (equipment, supplies, etc.), and training foreign nationals in specific skills. In many such cases, AID technical assistance is critical, since the foreign government involvement may actually be financed by a long-term, low-interest loan from AID or from a development bank. This is another relatively inexpensive way for the United States to furnish assistance, again with the risk that final achievements of the project may or may not match U.S. interests. This mechanism also offers a good prospect for involving U.S. companies (e.g., fishing companies and marine equipment suppliers) in ways that can be potentially helpful both to the recipient country and to U.S. interests.

The Guinean Trawling Survey (Appendix B.2) represents another mechanism in which AID channeled funding through a regional organization and retained no formal management responsibility. The Organization of African Unity/Scientific, Technical and Research Commission (OAU/STRC) hired a project director, leased fishing vessels, and assembled its own

multinational staff. Operational details were handled by the director, who reported directly to the OAU/STRC and only indirectly to AID through a scientific advisory committee. In part, the scientific nature of this project permitted such arrangements, as the tasks were narrowly defined and involved few additional technical assistance components. The principal output of the project was the survey; training or local institutional development were not objectives of the project. Under this arrangement, AID had little operational control over the project but benefited from the resulting flexibility and simplicity of management. Most of the project staff and the scientific advisory committee were experienced scientists from the United States or Europe.

Another variant of AID's regional approach was the East African Freshwater Fisheries Project conducted on Lake Victoria during 1973-80 (Appendix B.3). In this case, AID worked through a regional technical organization, the East African Freshwater Fisheries Research Organization (EAFFRO), which was a technical arm of the East African Community. Unlike the Guinean Trawling Survey, this regional organization was separately funded and already conducting an active scientific program. Rather than a single research product, the objective in East Africa was training and wide-ranging technical assistance to augment the capabilities of EAFFRO. Field operatives were hired directly by AID, and technical assistance was delivered to EAFFRO installations.

In one sense, the East Africa program reflects a necessary evolution in regional aid mechanisms from the Guinean Trawling Survey a decade earlier. Local technical organizations were operating in East Africa and the initial scientific groundwork had been laid by other technical assistance and local research programs. In this situation, formal administrative control of the program rests firmly with the recipients. The donor agency has little control over the scientific content of the project, although expert advisers still exercise great influence. It would appear that future aid programs will have to adopt this pattern of shared control over projects.

The Philippine programs are a patchwork involving direct AID assistance, U.S. university activity, Philippine universities' involvement, and Government of the Philippines (GOP) departmental action (Appendix B.4). The Southeast Asian Fisheries Development Center (SEAFDEC) has participated in this program from the outset, and lately the International Center for Living Aquatic Resources Management (ICLARM), which receives direct core support from AID, has joined these efforts. In addition the various fisheries activities of U.N. agencies in the Philippines intersect the U.S. operations at many points. Thus the situation in the Philippines is very complex, but the overall direction of the program is firmly in GOP hands. The AID program must be responsive to local needs as perceived by the Philippine government, which is actively seeking, and is open to, U.S. scientific and technical advice.

The core funding for ICLARM represents a departure from past AID policy for fisheries. ICLARM resulted from a Rockefeller Foundation initiative to create an International Institute for Fisheries similar to the successful international agricultural research centers but without the large, permanent physical structures associated with them. ICLARM conducts fisheries programs and projects with a primary emphasis on problems related to fisheries development. In supporting this enterprise, AID is following its pattern of support for the agricultural centers and is obtaining access to a group of fisheries experts who are outside university systems and are free from control by any national government. ICLARM could be a very useful resource so long as its work is competent and accepted and its policies are generally in line with AID objectives.

Increasingly, U.S. fisheries assistance is offered within the framework of recipient government requirements and control. This is the apparent situation in the very large aquaculture and Red Sea fisheries programs now under way in Egypt. Nevertheless, selection of experts is essentially in U.S. hands and since the developing country is highly dependent on advice from these experts, a considerable measure of control is still held by AID program managers.

Similarly, U.S. fisheries assistance is increasingly delivered in collaboration with local institutions. The proliferation of technical institutions in developing countries reflects the growing importance of marine resources to developing countries as well as the cumulation of past assistance in technical training and institution building. Such institutions present new opportunities for cooperative programs and for ongoing collaboration. Local institutions can provide focal points for new programs as well as local definition of research problems. They are also centers for ongoing scientific data collection and monitoring. Local fisheries institutions could become an active constituency for fisheries development within national policymaking and development agencies. The political strength and expertise of these national fisheries institutions may vary widely within a particular region. However, they do permit greater emphasis on regional programs because most states in the region will derive some benefit from such programs.

For aid donors, regional programs tend to be larger and more expensive, but they may permit more productive use of funds and the promotion of technical cooperation among developing countries. Regional imbalances in technical capabilities have always presented the strategic issue of whether to focus technical aid on the very progressive or the very impoverished countries. The key task seems to be to design aid programs that will ensure that the more advanced developing countries become transmission belts to the less developed for the skills, technologies, or knowledge involved in the project.

The evolution in AID fisheries assistance mechanisms also reflects changing recipient needs. The earliest postwar projects were directed toward mechanization of fleets, introduction of modern gear, and

exploratory fishing for new stocks. In most artisanal fisheries, these remain the essential needs. However, the needs of developing countries in 1980 tend to be much broader than in 1960. For example, fishermen in some coastal or insular developing countries, such as the Philippines, have adapted rapidly to new gear and fishing techniques. Their principal needs now include processing techniques for export markets and management of stocks being heavily fished. Aquaculture and mariculture projects require not only technical knowledge in fish farming, but also related expertise in areas such as economic and environmental impacts, engineering, and coastal zone management. For the more advanced developing countries, assistance will increasingly take the form of cooperative research or short-term advisers assisting in mutually agreed upon projects.

In short, fisheries in developing countries now vary from artisanal to modern export industries. Requests for fisheries assistance are increasingly diverse. They require a wide variety of project mechanisms by donor agencies as well as expertise that often transcends traditional disciplinary boundaries. The agency providing fisheries assistance must employ various patterns of institutional linkages with recipient country agencies and institutions. Recent AID assistance mechanisms, such as the 211(d) grants and the multiple arrangements of the Philippine case discussed in Appendix B.4, indicate AID efforts to adjust to this evolving situation.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

This section presents the general conclusions drawn from MTAG's evaluations of AID fisheries assistance programs. It is structured as a series of questions, each followed by discussion and a recommendation to guide future AID fisheries assistance programs.

- (1) Should the United States provide fisheries assistance to developing countries?

There are two aspects to this issue, the first of which relates to the role of fisheries in overall U.S. assistance strategies. Given the basic policy decision to assist development in areas of critical need, especially food supply, then fisheries would seem a necessary component of the U.S. assistance program. Increased protein supplies through fish production are an immediate goal of many developing countries, particularly those coastal states now acquiring extended jurisdiction over adjacent ocean spaces. Fish constitute about 25 percent of the world's protein supply; developing countries take about half of the world's catch but account for only about one quarter of the world trade in fish. AID, as the largest bilateral assistance agency, should not exclude this critical aspect of development from its agenda. An integrated approach to development assistance requires that AID be capable of addressing the entire spectrum of food production methods, including fisheries and aquaculture. U.S. fisheries expertise should not be foreclosed from developing countries seeking assistance because of some past AID project failures, as was the case in the early 1970s.

The second aspect of this issue is the costs and benefits likely to accrue to the United States through fisheries assistance. Other than project expenditures by AID (which, in an absolute sense, are relatively small), the costs to the United States appear minimal. There is currently little direct competition between the U.S. fishing industry and fishermen in developing countries except in shrimp and, to some extent, in tuna. Entry into U.S. coastal fisheries by foreign distant-water fleets is now regulated under the U.S. 200-mile zone of fisheries jurisdiction.

On the other hand, fisheries assistance offers many potential benefits to U.S. fisheries-related industries. Increased fish consumption throughout the world could create new markets for U.S. fish products or make new sources available for U.S. processors. The exploitation of new stocks presents opportunities for U.S. investments and joint fisheries ventures. Fisheries development provides potential markets for U.S. vessels, equipment, technology, and expertise. Fisheries assistance may further U.S. scientific understanding of tropical ecosystems. Proper management of local fisheries stocks permits more realistic planning by U.S. distant-water fleets. Likewise, fisheries management could prevent economic dislocations, such as the Peruvian anchoveta decline, as well as the overcapitalization of developing countries' fishing fleets, which could eventually add to exploitation pressure in other regions.

Other benefits may accrue in the diplomatic sphere. Fisheries assistance promotes a climate of cooperation between the United States and recipient countries. This could facilitate trade-offs in other areas, such as passage for warships or entry of scientific vessels. In the event the law of the sea deliberations do not produce a global ocean treaty, fisheries assistance projects could become useful bargaining chips in bilateral negotiations with developing countries over activities within the zones of extended jurisdiction likely to be claimed by most coastal states. There is already evidence of a trend toward strictly bilateral agreements for marine resource exploitation. If the United States does not provide assistance, developing countries may seek help elsewhere.

In the political sphere, fisheries assistance contributes directly to the overall U.S. foreign policy objectives of fostering political stability and economic interactions in the developing world. By increasing the amount of protein available to developing countries, U.S. fisheries assistance could reduce the possibility of political conflict over food resources, both within recipient countries and across national borders. By providing the expertise and equipment for developing countries to feed themselves, the United States could help reduce future dependence on food aid. Strong economies based on healthy populations increase the potential for U.S. overseas trade and investment in all economic sectors. Relatively minor expenditures may be sufficient to upgrade fisheries capabilities in many areas.

MTAG recognizes that fisheries assistance is but one of many areas of development with pressing needs and potentially great benefits. In a political climate of reduced AID budgets, clarion calls for expanded programs in one area must be tempered by practicality. However, MTAG feels that fisheries assistance deserves recognition within AID as a principal and often overlooked means of meeting the priority objective of expanding food production in developing countries. Moreover, fisheries have a direct and immediate linkage to ongoing law of the sea negotiations and critical U.S. marine interests, including defense and science. For these reasons, fisheries assistance appears to provide an

effective use of AID funds and to merit greater organizational prominence and support by AID.

Fisheries assistance therefore has potential benefits to the United States, both immediate and long-term, far outweighing its costs. These would accrue to both the United States and the recipient countries. On balance, U.S. fishing industries and consumers would benefit from such programs. Moreover, U.S. fisheries assistance would advance various national political and strategic objectives.

RECOMMENDATION: The United States should provide fisheries assistance to developing countries. Such assistance is warranted both for humanitarian reasons and from the broadly utilitarian perspective of achieving U.S. foreign policy objectives.

- (2) Does the United States have the technical and institutional capability to provide fisheries assistance to developing countries?

It might be asked how a country that imports 60 percent of the fishery products consumed by its people while surrounded by extensive fishing grounds (which until recently were fished mostly by foreigners) can assist other countries to develop their fisheries. Compared to the fisheries in countries such as Norway, Iceland, and Japan, fisheries are a very small part of the U.S. economy. Except for tuna, and to a lesser extent shrimp, the United States has not recently competed effectively in international fisheries. Few recent developments in fishing technology can be said to have originated exclusively in the United States.¹⁰

Institutionally, there is no formal linkage between the U.S. fishing industry and U.S. universities as there is in agriculture. Even with the advent of the Sea Grant colleges, linkages have still been tenuous at best. Of course, there are exceptions, as a few universities do maintain contacts in a limited but continuous way. There is some scholarship and instruction in fisheries in U.S. universities, and this is augmented by the scientific activities of the National Marine Fisheries Service, which maintains strong relationships with certain universities. Unfortunately, the great body of fisheries and aquaculture knowledge in U.S. universities is primarily in temperate and cold-water fisheries, whereas understanding of tropical fisheries is limited.

In addition, there is currently little U.S. expertise in small-scale and artisanal fisheries, particularly those involving tropical environments. Fisheries historically have been a very small part of AID's activities, and the agency has obtained its fisheries expertise on loan from NOAA. Other bilateral and multilateral donors traditionally have provided most of the fisheries technical assistance to developing countries. They may be better qualified to continue doing so by virtue of interest, experience, and expertise (although

other developed nations may also lack expertise in tropical fisheries). For these reasons, it has been suggested that direct fisheries assistance should remain a low priority for AID and that leadership and large projects be left to other donors.

On the other hand, U.S. technological achievement extends to many areas relevant to fisheries development. Other donors may be unable to provide the range of technical services available through the U.S. scientific and technical infrastructure. For example, there is extensive U.S. expertise in fundamental aspects of fisheries biology, technology, and management that is of general applicability to developing countries. The word "management" here means governmental control and regulation of fisheries operations in various localities. The other principal areas of U.S. expertise that could be applied to fisheries in developing countries are fundamental science and research training, industrial management, and the ability to apply technology to practical problems.

In aquaculture, there is ample expertise among U.S. institutions and government agencies, particularly in the West and the South. Once again, this expertise traditionally has been concentrated on temperate-zone species, mainly trout, salmon, catfish, and oysters. Nevertheless, there is a substantial amount of knowledge about modern fish culture methods, and there is considerable U.S. research being done in this field, including study of tropical species (tilapia).

In summary, although fisheries constitute a relatively small part of the U.S. economy, the United States possesses extensive scientific, technological, and managerial expertise in fisheries-related fields. Much of this expertise is unavailable elsewhere. In addition, various U.S. institutions have the capability and experience to assist developing countries in their fisheries programs. The United States therefore could make valuable contributions to global fisheries development.

RECOMMENDATION: There is a significant body of fisheries expertise and technology within the United States that should be made available to developing countries seeking to survey, exploit, or manage their fisheries resources. U.S. organizations and agencies should be encouraged to participate in fisheries programs in developing countries, including joint programs in concert with other donors.

- (3) Should AID be the lead U.S. agency for delivering U.S. assistance to developing countries in fisheries and aquaculture?

MTAG's review has pointed out various shortcomings in AID administration of fisheries programs, as well as some notable successes. These shortcomings appear to have stemmed largely from the low priority accorded to fisheries development by AID and from the lack of in-house fisheries expertise in program management.

For example, MTAG's review indicates the lack of a clear direction in AID fisheries policy. Projects in fisheries and aquaculture are governed by the legislation, policy formulations, and program guidelines for agriculture. Beyond the overall objectives of providing protein, jobs, and income to the rural poor, AID does not have a fisheries strategy as such. There is no official statement of position with regard to fisheries development, nor any long-term strategy to guide program development in regional bureaus or country missions.

This lack of fisheries strategy may be due in part to the lack of a separate fisheries office in AID. Because fisheries programs have been administered through the Office of Agriculture within the Development Support Bureau (DSB), program managers trained in agriculture sometimes have misunderstood the nature of marine capture fisheries as well as their potential role in development. AID has emphasized aquaculture, an area with as yet uncertain effects on fish consumption and income enhancement in developing countries. Moreover, the AID approach to fisheries assistance lacks integration: programs in aquaculture, inland fisheries, brackish-water systems, and marine fisheries are not coordinated with one another or with overall food production goals. Without clear priorities, the favored type of fisheries development vacillates over short periods, with short-term programs addressing inherently long-term needs.

One alternative to AID administration of fisheries assistance programs is to shift responsibility for these programs to other agencies more familiar with fisheries problems. The most logical candidate is the National Marine Fisheries Service (NMFS) within the National Oceanic and Atmospheric Administration (NOAA). NMFS has the requisite technical expertise in fisheries and aquaculture, has personnel with experience in assisting developing countries, and operates a set of regional laboratories, some of which possess good contacts with developing countries and expertise in tropical fisheries.

Despite the technical expertise assembled in NMFS, there are other overriding factors that would indicate continuing AID management of U.S. fisheries assistance programs. First, overseas technical assistance is only a peripheral mission for NMFS, whose primary statutory responsibility is development and management of domestic U.S. fisheries. NMFS is not structured or funded as a technical assistance agency. It now performs some technical assistance and other overseas functions, but the NMFS component offices involved in these activities would require substantial enlargement to manage large-scale overseas development programs (NMFS is fully committed to a support function under the Fisheries Conservation and Management Act). On the other hand, AID's principal statutory mission is development assistance, and it maintains permanent overseas field missions to assist in project identification and oversight duties. Second, as a development assistance agency, AID is more accustomed to taking a longer view of development beyond the confines of a particular project, and to integrating fisheries projects into overall development plans.

Long-term assistance mechanisms, such as institution-to-institution relationships, are better handled by agencies that have such a long-term perspective.

MTAG's conclusion that fisheries assistance should remain centered in AID is not meant to imply exclusion of NMFS from fisheries assistance. In fact, the latter agency must remain an active partner with AID if effective fisheries programs are to be implemented in the future. NMFS can serve as a source of fisheries expertise for project-specific tasks and AID policy formulation, as an executing agency, and as manager of certain technical and cooperative programs in developing countries.

Moreover, AID should seek linkages with other fisheries institutions in order to supplement its small staff of fisheries experts on loan from NOAA. Other federal agencies, such as the Coast Guard and Overseas Private Investment Corporation, could provide some components for fisheries programs. Domestic organizations, such as universities, state agencies, and private industry could be sources of fisheries expertise. Other development assistance agencies, such as the Peace Corps and religious relief agencies, have extensive field experience in assisting artisanal fisheries. On the international side, various development assistance agencies with active fisheries programs could support AID fisheries programs. These include other national aid agencies, the U.N. Food and Agriculture Organization, and nongovernmental agencies such as the International Center for Living Aquatic Resource Management (ICLARM) and the Oxford Committee for Famine Relief (OXFAM). Some developing countries operate fisheries departments or research institutions with extensive expertise in local or regional fisheries. All of these agencies could complement or participate as co-donors in AID fisheries programs. Linkages with such groups are essential to ensure that fisheries expertise, field agents, and executing agencies are continuously available to AID.

RECOMMENDATION: Because of its statutory mandate as the central U.S. foreign assistance agency, AID should remain the primary sponsor and coordinator of U.S. fisheries assistance programs. AID should maintain close contacts with other organizations that have fisheries expertise, particularly the National Marine Fisheries Service. AID should use these organizations as executing agencies and, where appropriate, enter into joint projects with other fisheries assistance donors.

- (4) Is the present AID structure adequate for the administration of large-scale fisheries assistance programs?

MTAG's evaluation has indicated several deficiencies in the administrative mechanisms by which fisheries programs are initiated and executed. These were elaborated on in the preceding discussion of AID's role in fisheries. The primary problems cited there were the lack of in-house fisheries expertise, lack of clear directions in fisheries assistance policy, and lack of clear priorities for food production from fish.

In-house expertise appears to MTAG to be especially critical for the formulation of an AID fisheries strategy.* AID must be capable of addressing such issues as the priority to be accorded to fisheries in development, the circumstances under which capture fisheries or aquaculture will be stressed, and the criteria for selecting recipients for major fisheries development programs. Likewise, AID must be capable of responding to the broadening range of assistance requests from developing countries. This implies an overall fisheries strategy developed by experts within the organization rather than advisers or consultants. Fisheries projects derived from this policy should be administered through a unit organizationally distinct from agriculture within the AID structure.

As of September 1981, AID fisheries expertise in Washington consisted of two fisheries advisers provided by NOAA under the terms of an interagency agreement initiated in 1976. Although the interagency agreement also provides for a senior fisheries adviser, the position is now vacant. Through normal turnover and lags in recruitment of replacements, these three positions have not been continuously filled in recent years.

Until recently, centrally funded fisheries programs were located in the Fisheries Division of the Office of Agriculture within the Development Support Bureau (DSB). In 1980, the Fisheries Division was consolidated with several other divisions into a new Division of Renewable Natural Resources Management within the DSB Agriculture Office. A 1981 AID reorganization changed DSB to the Bureau for Science and Technology (STB), which contains four directorates: (1) Food and Agriculture, (2) Health and Population, (3) Energy and Natural Resources, and (4) Human Resources. As of September 1981, organization of STB below the directorate level had not been completed. Fisheries logically could be placed under either the Food and Agriculture Directorate or the Energy and Natural Resources Directorate. However, the fundamental problem affecting past AID fisheries programs has been that most decisions regarding fisheries have been made by people whose training and experience has been primarily in agricultural methods of food production.

MTAG has concluded that effective AID fisheries and aquaculture programs will require both structural changes and recognition of fisheries as activities distinct from agriculture. MTAG therefore suggests several measures to clarify and enhance the position of fisheries within AID. First, there should be a fisheries/aquaculture expert stationed at a policymaking level to represent fisheries in

*A 1957 consultant's report evaluating the Indian program makes the same plea for "a technically trained fisheries man...to supervise and coordinate all fisheries programs." Richard van Cleve, "Survey of the TCM Fisheries Program in India," (March 1957), p. 15.

overall program formulation and internal budgeting reviews. This representative could be designated a special adviser reporting directly to the administrator or to the senior assistant administrator (Science and Technology Bureau), or the newly created Office of the Science Advisor. Second, this fisheries adviser also could head a special staff office attached to one of the STB directorates (probably Food and Agriculture or Energy and Natural Resources) and staffed by the three fisheries advisers on loan from NOAA. This staff office could both assist in the formulation of AID fisheries policy and provide technical advice to the regional bureaus and to other directorates within STB. AID fisheries experts might eventually either replace or supplement the advisers on loan from NOAA. In addition, fisheries advisers could be stationed in each of the regional bureaus and in the regional field offices. In the event that AID fisheries programs are expanded significantly, making a larger fisheries staff necessary, then the staff office for fisheries could be upgraded to become the fifth directorate within the Science and Technology Bureau.

MTAG considers this step desirable to provide the necessary technical and professional expertise to place fisheries on an equivalent footing with agriculture in policy debates over the relative merits of plant versus fish protein for meeting the nutritional needs of the rural poor. Fisheries and agriculture programs would remain under the same policy guidelines established for food and nutrition and administered by the Science and Technology Bureau. However, it is important to recognize that fisheries are an alternative strategy for supplying protein and in some cases may compete with, or be preferable to, agricultural means. Fisheries, especially capture fisheries, are activities distinct from agriculture and very different in their operating modes, constituencies (a common property resource) and conceptual framework (hunting and gathering as opposed to farming). When administered jointly with other resources subject to more managerial certainty, such as agriculture, fisheries tend to be neglected or accorded a very low priority.

Another aspect of this dichotomy between fisheries and agriculture is that freshwater aquaculture (pond culture) would more naturally be grouped with agriculture, as its production techniques and constituency are more clearly akin to traditional farming operations. The fisheries staff office could then be responsible solely for marine resources (marine and inland capture fisheries, mariculture, and brackish-water culture). Yet, this separation would tend to fragment, and engender funding competition between, two fields that have a great deal of scientific and operational commonality. This is a nagging organizational problem that probably has no easy solution. However, the central point to MTAG is that fisheries be administratively recognized as a distinct function and be provided with its own cadre of experts and constituency within the Science and Technology Bureau.

Other organizational measures appear necessary to enhance the effectiveness of AID fisheries programs. The overall policy and

program initiatives developed by AID fisheries experts within STB must be communicated both to the regional bureaus and to the country missions and offices in recipient countries. This is particularly important in light of AID's decentralized structure and relatively autonomous regional and country offices. AID personnel qualified in fisheries should be stationed in the regional bureaus and in the field offices, particularly in the regional offices that serve multiple recipient countries. (As of July 1981, two missions managing fisheries and aquaculture projects--Indonesia and the Philippines--had in-country fisheries experts attached to the country mission.) Besides managing projects, field personnel with fisheries expertise could ensure that recipient desires or needs in fisheries are adequately represented in the Country Development Support Strategies (CDSSs) and in the project identification process. An alternative approach would be stationing marine affairs representatives in AID missions in coastal countries, giving them overall responsibility for all marine-related programs, including fisheries.

Finally, AID's institutional memory regarding fisheries projects needs to be strengthened. Some institutional awareness of fisheries projects conducted by other donors would also seem desirable. It is likewise essential that AID fisheries policy be communicated to the National Marine Fisheries Service and other centers of fisheries expertise, both academic and industrial. This would facilitate coordination and ensure that AID policy receives the external feedback necessary to remain consistent with academic and applied fisheries knowledge.

RECOMMENDATION: AID should enlarge its in-house fisheries staff, including representation at the policymaking level, and should remove fisheries programs from administration by the agricultural office. The AID fisheries staff should define a coherent AID fisheries development strategy that includes the types of assistance to be offered, the priority to be accorded to various types of fish production methods, and the criteria by which requests for fisheries assistance will be assessed for funding. The stationing of fisheries experts at AID headquarters in Washington should be supplemented by fisheries professionals serving in AID field missions.

- (5) Should AID seek participation by U.S. universities in its fisheries programs abroad?

Universities are valuable sources of individual expertise for AID programs and have been used in this way since the beginning of overseas projects. Enrollment of students from overseas and the broad interests of university faculties have generally ensured that some work relevant to AID interests has been ongoing at many U.S. universities, although the extent of this activity has varied widely. In many fields, U.S. university faculty have expertise and research skills that are unavailable elsewhere. Various kinds of contractual arrangements have been used in promoting university involvement in foreign assistance.

These arrangements include personal services contracts, Basic Ordering Agreements, and core support or institution-strengthening grants. Universities have most commonly been employed as project management agencies where education, training, and extension services were involved, particularly in agriculture.

However, there are fundamental differences between AID's foreign assistance mission and the traditional role of universities. These differences derive from the nature and purposes of universities and the tasks they are designed to perform. In many cases, both AID and the universities hired to execute development assistance programs have shared in misunderstanding of these differences. Serious problems can result from universities' attempting to perform overseas technical assistance tasks for which they are not designed.

The 211(d) mechanism as applied to the fisheries field by AID reflects these fundamental mismatches. Maintaining a continuing AID response capability housed within a U.S. university presents certain dilemmas for the universities. First, university staff involved in overseas development assistance may suffer in terms of the recognition and promotions normally associated with academic careers. Second, field personnel hired by universities specifically for overseas tasks generally are selected on a narrower range of criteria than the regular academic staff. Primary orientation to field operations can detract from the creativity and research excellence being sought by AID. Third, relations between the field operations unit and the regular academic departments may present difficulties, as the former may become isolated within the university. Finally, in some cases developmental problems may require special multidisciplinary expertise or approaches that may be unavailable in the university or may require extensive funding for separate new institutions.

With regard to the problem of continued funding for university-based overseas development units, MTAG believes that all major universities expect their faculty to be active in three areas: research or scholarly activities, teaching, and public service. Clearly, public service encompasses various kinds of professional activity, including service to various levels of government. However, public service is only one aspect of the individual faculty member's work and is not intended to be a full-time occupation--especially if he or she is not paid. When universities become involved in large-scale foreign assistance operations extending over long periods, it is common for ad hoc temporary faculty to be hired specifically for the overseas positions. It would be intolerable for regular faculty to be consistently absent from the university where they are expected to fulfill numerous functions in teaching and administration as well as research.

To become integrated into the university system, the development assistance program must fit within university objectives, and, in the absence of external funding, this usually implies a facilitation of

scholarship or teaching. Technical assistance programs rarely provide such opportunities unless they involve long-term relationships with overseas universities or research institutes where exchanges of students and faculty become possible and research of mutual interest can be pursued. Moreover, state institutions, which commonly possess expertise in applied science and technology, are funded to apply that expertise primarily in areas of interest to the state in which they are located. For state universities as well as private universities deriving their baseline funding from state legislatures, some outside support is usually necessary to underwrite development assistance activities.

This is recognized in the new Title XII concept, which seeks to strengthen the land-grant and Sea Grant universities and to mobilize them for active participation in overseas development programs. The Title XII strengthening grants and research support programs involve consortia of U.S. universities with overseas linkages. In these programs there is also an expectation of significant university contributions through a mandatory matching funds requirement. However, at a time when state operating funds for teaching and research are barely adequate, it seems unlikely that the Title XII program will succeed in converting many departments to an overseas orientation. Moreover, some universities and research institutes with expertise in marine science may be deterred from conducting development programs overseas by the complex administrative requirements to qualify for the Title XII programs.

Nevertheless, Title XII grants do address the critical problems of university involvement in foreign assistance operations. By focusing on development problems that cross traditional disciplinary lines, Title XII may enhance university expertise in areas not normally considered in U.S. schools. The consortium approach is designed to assemble a core of experts at the participating institutions. From this pool, AID could more quickly locate technical advice and project staff. The consortium approach likewise fosters linkages among numerous U.S. institutions and, equally important, facilitates linkages with institutions in developing countries. Finally, Title XII enhances communication and access to experts in fields where the United States has a comparative scientific advantage over other donors. For example, U.S. institutions (universities and government agencies) are among the world's leaders in the following fisheries-related fields: basic fisheries research and statistics, stock assessment, fisheries management and enforcement, food and nutritional problems of fish, coastal zone management, resource economics, and technology assessment.

There is ample evidence that successful development requires a strong body of scientific and technically trained people in the developing country so that technical knowledge may be applied directly to local problems. Moreover, to sustain development progress, an effective system of technical and scientific education must be established. This is the area in which long-term university involvement

can be most effective. However, this requires involvement of many universities along the lines of Title XII rather than 211(d) programs as well as some freedom from the strictures of the "new directions" policy, which stresses assistance to the poorest people in the countries that receive assistance. One major benefit of an arrangement between universities (or between a university and local institutions, such as fisheries agencies or research institutes) is that it provides for the possibility of normal advancement of U.S. faculty who are involved in the program, since they will function in the accepted university mode. This has been a major problem in previous overseas programs.

Moreover, an effective extension program concomitantly established in the developing country university can carry out technology transfer at different levels simultaneously. More importantly perhaps for the long term, it could lead to the development of domestic solutions to local problems.

The most promising programs for meeting present objectives in marine sciences seem to be those funded under the Sea Grant International Program and those expected to be established under Title XII. However, these have been under way for too short a period for significant results to have been achieved.

RECOMMENDATION: AID should use the fisheries expertise of U.S. universities to the fullest extent possible. However, the core support mechanisms, such as 211(d) or institution-strengthening grants, require large and indefinite expenditures and sometimes have not been fully utilized by AID in field projects. Therefore, AID should simultaneously explore other mechanisms for tapping into U.S. academic fisheries expertise, for example, institution-to-institution linkages. In particular, AID should apply to its fisheries programs abroad the special expertise of U.S. universities that is not widely available from other donors--e.g., basic fisheries research and statistics, stock assessment, food and nutrition, resource economics, socioeconomic impact assessment, and coastal zone management.

- (6) What lessons can be gleaned from past U.S. fisheries assistance programs?

MTAG's evaluation indicates first and foremost that AID fisheries programs were most successful when they reflected clear policy directives and priorities. A coherent fisheries strategy would permit AID to define what is important and feasible in fisheries assistance. From this overall strategy, AID could determine recipient needs and mechanisms for each fisheries program or individual project. However, since AID has never formulated this kind of comprehensive fisheries strategy, MTAG has no policy standard against which to measure the effectiveness of AID's fisheries program. Instead, MTAG has focused on the mechanisms employed and the lessons learned from several major programs. These mechanisms have varied greatly over time, and no one

mechanism was found to be preferable in all circumstances. An array of mechanisms therefore seems necessary to suit the exigencies of each particular request for assistance. The only clear trends have been the increased recipient participation in project design and administration and the growing number of national and regional institutions through which fisheries programs could be channeled in developing countries.

There are, of course, promising mechanisms that have been explored by AID and other donors in recent years. These include projects administered by multilateral agencies, such as Funds in Trust and the "multi-bi" concept* pioneered by the Scandinavian aid agencies, and support of projects by nongovernmental organizations. ICLARM presents a unique and potentially useful model for a nongovernmental fisheries organization. It is a private international organization for which AID now provides baseline funding. As its staff and programs develop, ICLARM may become an increasingly useful channel for supporting regional fisheries development. Similarly, the flow of fisheries information to developing countries and among fisheries institutions in both developed and developing countries is a neglected area that merits AID attention. Although these represent promising future mechanisms and directions, the remainder of this section will discuss lessons gleaned from past AID projects examined by MTAG.

First, AID fisheries assistance programs should recognize the critical importance of social, cultural, and economic factors surrounding fisheries within developing countries. The statutory mandates for AID's agricultural research policy, under which fisheries falls, encourage this broad socioeconomic perspective. Farming and fishing are both occupations that involve the whole life and social activity of the participants. In developing countries, societies may be dominantly organized around these traditional pursuits; families, villages, and whole districts may be committed to farming or fishing as the major source of food and income. Any development within these fundamental vocations is likely to take time and involve major social changes.

Such change may result from even minor technical advances such as improved nets or better aeration of fish ponds. Where major changes are involved, for example, commercialization of a subsistence fishery or a large expansion of the fishing power of artisanal vessels, the effects may be drastic and even socially disastrous. For this reason it is essential that the probable effects of new technologies be carefully assessed before they are introduced. Until quite recently, AID fisheries programs have not emphasized the sociocultural aspects of development. Adequate research in these areas has not been supported or carried out. Thus, technical assistance teams should always include

*"Multi-bi" projects are funded and/or administered by national aid agencies in conjunction with international organizations.

social scientists as well as natural scientists and engineers, as was attempted in ICMRD's Central American programs.

Second, AID has been most successful when it has adopted a holistic approach to fisheries development--that is, one that integrates all stages of the fisheries process, including catch, preservation, processing, marketing, distribution, and stock assessment and management. Effective fisheries assistance in developing countries should include attention to supporting services, such as fisheries extension programs, which have made up only a small part of previous fisheries assistance. The Indian and Korean programs were strikingly different on this point, as the Indian artisanal fishermen lacked an existing technical infrastructure or supporting services, and were unable to take full advantage of the outside assistance. Conversely, some later AID programs, such as the Guinean Trawling Survey and the more recent East Africa project, have focused primarily on scientific services without much attention to support or management institutions or to the means of exploiting the resources discovered. Where the lack of a local fisheries infrastructure would preclude an approach integrating all aspects of fisheries development, then a careful phasing of component projects is necessary to reach the overall development goals. In other words, the magnitude of the problem may require focusing on critically important sectors or small geographic regions, lest the program resources be dissipated in overly ambitious goals.

Third, recognition of the social and cultural context of local fisheries also implies that recipient countries should be chosen carefully. Past AID programs, for instance, the Korean Fisheries Revitalization Program, have enjoyed more success when they have received the firm backing and continued support of the host country governments. Conversely, the Indian program did not initially receive this support at either the state or central government level, and Indian fisheries development did not progress rapidly until that commitment was made.

A closely related inference is that AID programs examined by MTAG have been most successful in areas where the local population already relied on fisheries resources as a major part of their diet or economy. This implies an existing resource base, a tradition of exploiting that base, and a supporting infrastructure. Building upon existing infrastructure is easier and less time-consuming than building it for the first time. Under these circumstances, recipients of direct assistance are more likely to be receptive to programs aimed at improving their fishing or processing technologies. Extension programs, a necessary component to reaching a broad audience, are also more likely to be effective where fisheries activity is traditional within the country and experienced people are available to serve as extension agents. Similarly, extensive commitment by the host country government is more readily forthcoming when the importance of fisheries or aquaculture to the country is historically evident.

The choice of recipient countries is of course limited by the statutory criteria for eligibility established by Congress. For the poorest countries an existing fisheries infrastructure (which distinguished the Korean from the Indian programs) may be lacking. This apparent dilemma in AID project selection has been exacerbated by the low priority given to scientific and technological institution-building under AID's basic-needs strategy, as well as by the demise of the Institute for Scientific and Technological Cooperation as the proposed focal point for scientific and research assistance.* Without complementary assistance to building a fisheries research and management infrastructure, the long-term success of fisheries development projects may be jeopardized.

However, the dilemma over choice of recipients should not be overstated. Foreign assistance could be delivered to middle-tier countries through regional organizations, the Reimbursable Development Program, Economic Support Funds, joint programs with other donors, or the research grants program recently proposed for the Board on Science and Technology for International Development, of the National Research Council's Office of International Affairs.

A fourth critical factor emerging from MTAG's evaluation is project duration. Critics of U.S. assistance programs have repeatedly emphasized the disadvantages of the short-term ad hoc approach sometimes evident in AID fisheries programs. This is valid criticism even recognizing that the ad hoc approach may be forced on AID to some degree by shifting congressional or recipient government priorities. It may also derive partly from the congressionally imposed three-year project funding cycle, which tends to discourage long-term program plans, especially in the recent milieu of shrinking AID appropriations. The MTAG inventory of AID fisheries projects (see Appendix C) indicates that of 114 projects whose duration could be specified, 64 projects (56%) were completed in less than three years. Only 22 projects (19%) lasted more than 6 years. Although short-term projects always will be necessary to meet unforeseen needs or recipient requests, fisheries assistance in developing countries would seem to require a longer time perspective. The assistance programs in Korea and India demonstrated that ultimate success required extended donor commitment and did not become apparent until nearly 20 years after the programs were begun.

Follow-through is another necessary element of program success. Technical assistance of even the highest caliber, such as the Guinean Trawling Survey, cannot be delivered in a vacuum if it is to have some

*Statements by the incoming AID administrator have stressed the importance of increasing the scientific and technological capabilities of developing countries. The establishment of the Bureau of Science and Technology is an effort to enhance the agency's ability to achieve that goal.

impact on national development. This is particularly important in fisheries operations in which the uncertainty of the catch and dependence on weather conditions can lead to periods of limited catch even in soundly designed programs that ultimately prove successful. Projects must run long enough to go through cycles of success and partial failure, and to take advantage of new opportunities that are presented. Lacking this follow-through, there is often a reversion to the old ways, the limits of which are well understood, and progress may be halted or even reversed.

Fifth, past AID programs indicate the need for involvement of U.S. fisheries personnel with practical experience in various kinds of fisheries and an ability to interact positively with local fisherman as well as with scientific colleagues and government personnel. Previous overseas experience also appears invaluable for advisers working in developing countries, and it underscores the importance of regular overseas contacts by U.S. institutions. The Marine Technical Assistance Group acknowledges the difficulties of recruiting professional fisheries staff because of budgetary uncertainties, congressionally imposed personnel ceilings, low priority of fisheries within AID, and limited opportunities for advancement. Nonetheless, a core staff of fisheries experts appears essential. Experienced fisheries personnel could be recruited through close interaction with the National Marine Fisheries Service, U.S. industry or universities, or even other donor agencies. Working relationships with other institutions in developing countries are especially useful and should be encouraged by AID. Such overseas contacts are critical for AID fisheries programs to keep abreast of developments elsewhere, to stimulate new programs and approaches, and to obtain advice from local experts on project design, execution, or evaluation. Increasingly, developing countries will be requesting short-term advisers for specific problems affecting local projects. Thus, close coordination with other donors and centers of fisheries expertise is particularly important if AID continues or expands its recent levels of fisheries assistance.

Finally, flexible program administration appears necessary to reflect the nature of fisheries resources. Conditions in fisheries change rapidly with the discovery and exploitation of stocks and with natural cycles and catastrophic events. Integrated fisheries programs require the flexibility to respond to evolving needs and resources by changing emphases and adding or dropping project components. Flexible program administration is enhanced by experienced fisheries staff with a clear idea of the potential of fisheries resources and clear goals translated to the project level. Without such goals, fisheries programs respond primarily to agricultural concerns and other priorities injected into the fisheries area.

In summary, successful AID fisheries programs examined by MTAG have been distinguished by major U.S. financial backing, long-term commitments, broad integrated programs encompassing all aspects of the

fishery from capture to market, expert advisers with practical experience (domestic and overseas), working relationships with local institutions, and flexible program administration that reflects the fundamental nature of fisheries. Successful programs have occurred in regions that have good resource bases, where fish have traditionally been an important part of the local diet and economy, and where there are strong recipient government commitments to fisheries development. Fisheries programs lacking these elements seem to run a higher risk of failure. However, some high-risk projects may be justified for political reasons or because of compelling recipient needs or potentially large payoffs.

RECOMMENDATION: Proposals for AID fisheries programs should be assessed in light of the factors, enumerated above, that have typified past successful programs. Selection of recipients should be based on the likelihood of success. Program evaluation should be a continuing priority. AID likewise should examine the factors that have contributed to success or failure of past fisheries programs, including those of other donor agencies, to evaluate plans for future programs. However, AID should recognize that recipient needs and the ingredients for success may evolve over time.

- (7) How can AID best address the needs of recipient countries in its fisheries programs?

In appraising the needs of a recipient country for food and for economic development, AID should consider the potential of marine and inland capture fisheries as well as aquaculture and mariculture. Previous AID approaches to food shortages have emphasized land-based resources. In recent years, this agricultural orientation has produced an emphasis on pond aquaculture, an endeavor that has great potential for increasing per capita consumption of fish protein and increasing the incomes of poorer segments of the populations in developing countries. However, about 96 percent of world fish production now comes from capture fisheries. Although it is difficult to estimate the extent of the "wild" harvest taken by artisanal and small-scale fishermen, it is certainly much greater than that from aquaculture and is likely to remain so for some time.

Clearly, the bulk of world supplies of fish protein will continue to come from the natural fish populations of the ocean for the foreseeable future, perhaps 10 years. However, the fishing of certain species is approaching the limit for sustainable yields in many areas of the world and may lead to depletion of certain fish stocks. There is a pressing need, therefore, to make better use of present fish stocks, including currently underused species. Possible approaches include reduction of the large postharvest losses in the fishing industry, particularly in developing countries. Special emphasis should be given to economic use of the by-catch associated with shrimp fishing. New means could be explored to make use of fish products as ingredients in processed foods and to recover valuable marine

biological products and pharmaceuticals, such as chitin and heparin, as by-products of the fishing industry. The challenge to fisheries management in developing countries is not so much to increase production but to improve the use of current fish stocks while maintaining present yields.

Recent AID funding levels do not reflect the predominance of capture fisheries. This is seen in the relative balance of 211(d) funding between aquaculture programs at Auburn University's International Center for Aquaculture and capture fisheries programs at the University of Rhode Island's International Center for Marine Resources Development. AID should continue to support development of aquaculture and mariculture as particularly promising sources of protein and income. AID should recognize, however, that the immediate needs of developing countries would be better served by focusing attention on existing capture fisheries, particularly labor-intensive artisanal and small-scale fisheries that conform to AID's basic-needs strategy. AID funding should more closely reflect current fish production patterns and recipient-country needs for assistance.

In designing fisheries assistance programs, there is occasionally conflict between enhancing fish exports to world markets and resolving the protein-supply problems in the recipient nation. Small-scale fisheries address primarily the latter problem but also can increase the income (and enhance the social status) of artisanal fishermen selling to local or export markets. Marine and inland capture fisheries programs therefore should focus on the more immediate returns available through assistance to artisanal and small-scale fishermen and exploration of untapped coastal resources. This is not meant to suggest, however, that AID eschew projects aimed at commercial fishing and distribution operations by developing countries. Ultimately, the AID goal should be mature, regulated fisheries serving both domestic and export markets. AID must also be capable of responding to the broadened range of fishery-related needs in developing countries.

RECOMMENDATION: The pressing needs of developing countries require emphasis on improved management and better use of current fish stocks through capture fisheries programs. At the same time, AID should not lose sight of the enormous long-range potential of aquaculture. AID funding patterns in fisheries should reflect these priorities.

NOTES

¹The Marine Technical Assistance Group is grateful for the cooperation of AID personnel, especially fisheries officer Kenneth Osborn in the Fisheries Office, former Deputy Assistant Administrator for the Bureau for Development Support, Eugene N. "Tony" Babb, and former AID fisheries adviser Philip Roedel.

²The Bureau of Commercial Fisheries, predecessor to the current National Marine Fisheries Service, has provided informal technical assistance, particularly to Western Hemisphere countries, since the early 1950s.

³For detailed discussion of the changes in U.S. foreign aid policies and AID activities as a result of congressional and presidential mandates, see "Marine Science and Technology for Development: In Search of a Policy," by Christopher K. Vanderpool of Michigan State University, and "U.S. Agency for International Development: Programs in Fisheries and Aquaculture for Fiscal Years 1980-81," by Shirley A. Clarkson. Both papers were commissioned by the Marine Technical Assistance Group.

⁴The most comprehensive treatment is in Pariser, Wallerstein, Corkery, and Brown, Fish Protein Concentrate: Panacea for Protein Malnutrition? (Cambridge, MA: The MIT Press, 1978).

⁵These figures are taken from the "Inventory of AID Programs and Projects in Fisheries and Aquaculture," compiled by the Marine Technical Assistance Group. See Appendix C.

⁶Clarkson, "Agency for International Development: Programs in Fisheries and Aquaculture," p. 32.

⁷Substantial U.S. assistance efforts in Korea continued into the 1970s and were focused particularly on augmenting the research and management capabilities of Korean agencies. However, most documentation available to the Marine Technical Assistance Group referred to the first phase, to which our analysis here is confined.

⁸For example, financing was made available to assist rebuilding of vessels after a particularly destructive typhoon in 1959.

⁹On the other hand, Auburn's approach gave it a cadre of experts on hand to meet AID requests immediately, whereas the ICMRD arrangement of ad hoc specialty units made it difficult to produce an expert on short notice from within the program.

¹⁰Some fishing technologies developed in the United States have been widely adopted overseas. These technologies include U.S. shrimp boat design, tuna clipper design, the Puretic Power Block, and crab-catching gear.

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APPENDIX A.1 Summary of Fishery and Aquaculture Projects of AID

AID Project Number	Time Frame		Geographical Distribution				Level of U.S. Funding (\$1000s)			Other Funding - Other Organizations
	Pre 1969	Post 1969	Latin America	Africa	Asia	Other	<100	100-500	>500	
150-0001		77-79				Portugal		170		
150-0002		77				Portugal		150		
263-0064		79-84				Egypt			27500	Egyptian Govt - 4000K; Egyptian Ministry of Agriculture
386-0005	52-62				India				2902	
391-0011	53-59				Pakistan			472		
391-0054	55-62				Pakistan				560	
391-0055	55-62				Pakistan			179		
391-0096	55-62				Pakistan		99			
391-0320	68-74				Pakistan					
409-0249		77-80			Regional			450		South Pacific Commission
439-0065.06	65-74				Laos				700	
442-0230	58-67				Cambodia			180		
484-0020	55-59				Taiwan			170		
489-0281	56-64				Korea				4662	Govt of Korea financial support for commodities, vessels, equipment and contribution to Revolving Loan Fund
489-0594.02	63-74				Korea					
492-0266		74-78			Philippines				889	Govt of Philippines-4600K

AID Project Number	Time Frame		Geographical Distribution				Level of U.S. Funding (\$1000s)			Other Funding - Other Organizations
	Pre 1969	Post 1969	Latin America	Africa	Asia	Other	<100	100-500	>500	
492-0234		70-74			Philippines				616	Philippine pesos-1,147,608; Auburn
492-0322		78-81			Philippines				1500	Bureau of Fisheries & Aquatic Resources (pesos) 13,572
493-0303		79-81			Thailand			442		Thailand-421K
493-179.2	68-72				Thailand			225		325K
493-180.7	67-73				Thailand			279		Auburn University
497-0001	51-64				Indonesia				613	
497-0189	69-81				Indonesia				2683	
497-0236		74-79			Indonesia			389		Auburn University contract
497-0266.3		79-83			Indonesia				1286	\$700,000 Govt of Indonesia
497-0266.6		79-83			Indonesia				980	\$800,000 Govt of Indonesia
497-0286		78-81			Indonesia				1500	\$1 million Govt of Indonesia
498-0214	69-73				Regional			285		Southeast Asia Fisheries Center
512-2474	66-74		Brazil						1000	Auburn University
513-0277		75-80	Chile						15000	Loan
513-0296		77-79	Chile						1016	IFICOOP-329K; Cooperative-77K
514-078		75-80	Colombia						2200	Loan; Govt of Colombia - 1082K
522-0124		76-79	Honduras							Auburn University
527-0144		77-80	Peru					465		Govt of Peru - 386K
532-0038		77-79	Jamaica					355		Govt of Jamaica - 622K; Auburn Univ.

AID Project Number	Time Frame		Geographical Distribution				Level of U.S. Funding (\$1000s)			Other Funding - Other Organizations
	Pre 1969	Post 1969	Latin America	Africa	Asia	Other	<100	100-500	>500	
532-0059		79-83	Jamaica						4527	Govt of Jamaica - 4858K; Peace Corps, partial loan by AID
603-0002		79-81		Djibouti					750	FAO-400K, France - 400K
615-0130	65-70			Kenya				222		Govt of Kenya 302K
618-0649.2	69-80			E.Africa					2392	
620-0212	60-74			Nigeria					4271	
620-0704	62-68			Nigeria					561	
631-0022		80-82		Cameroon					1325	GURC 1153K; Peace Corps
641-023	68-71			Ghana			60			Ghana - 15K; Other 236K
649-0066	57-66			Somali Rep.				389		
657-0006		79-82		Guinea-Bissau				500		Govt of Guinea-Bissau - 20K
660-056		76-80		Zaire				400		Govt of Zaire - 170K; COPELAZ-28K
660-0080		78		Zaire					10000	Loan
669-003	61-67			Liberia				328		
685-0240				Senegal				389		Senegal-60K; Peace Corps, PL480
695-0102		79-81		Burundi					540	44K; Auburn University
696-0112		80-82		Rwanda					2000	670K; Peace Corps
698-0620	62-66			Regional					728	Other funding
730-0317	67-70					Vietnam		280		
931-0042		74-79	Brazil					290		

AID Project Number	Time Frame		Geographical Distribution				Level of U.S. Funding (\$1000s)			Other Funding - Other Organizations
	Pre 1969	Post 1969	Latin America	Africa	Asia	Other	<100	100-500	>500	
931-0113	69-79					U.S.			2010	211d Grant to Univ of Rhode Island
931-0120		70-78				U.S.			1618	Grant to Intl Center for Aquaculture Auburn University
931-0242		75-78				U.S.		392		NOAA Advisory Services
931-0526		75-79							1224	Oceanic Foundation
931-0787	69-74					U.S.			835	Auburn University
931-1050		79-82							800	ICLARM
931-1155		77				U.S.		47		University of Miami Workshop
931-1156		78-79						49		SEAFDEC
931-1306		77-78							276	Resource Development Associates
931-1314		78-81				U.S.			882	211d Grant to Auburn University

APPENDIX A.2 Fishery and Aquaculture Projects of the Agency for International Development and Auburn University: Number of Projects and Expenditures.

	Type of Assistance						Total
	Training and Education	Transfer of Equipment	Research	Information Dissemination	Combined Operations	Workshops	
Number of Projects	2	2	7	3	78	2	94
Expenditures (\$1000s)	1,576.0	408.0	5,545.5	495.0	105,545.3	95.5	112,665.3

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NOTE: This table is based on an inventory of large fishery and aquaculture projects of the Agency for International Development from the 1950s to the present. Most of these projects occurred after the mid-1960s. This table includes 59 projects undertaken directly by AID and 35 projects conducted by the Auburn University International Center for Aquaculture under various AID contracts and institutional support grants. Expenditures for projects administered by Auburn totaled \$7.9 million; the remaining \$104.8 million of expenditures was for projects administered directly by AID.

APPENDIX A.3 Fishery and Aquaculture Projects of the Agency for International Development and Auburn University: Project Duration and Number of Developing Country Personnel Involved.

	Project Duration					Total
	Less than one year	1-3 years	4-6 years	More than 6 years	Unknown Duration	
Number of Projects	21	26	23	21	3	94

	Types of Personnel					Total
	Professional-Level		Technician-Level		Unknown	
	Activities in U.S.	Activities in host country	Activities in U.S.	Activities in host country		
Number of Developing Country Personnel	504	290	34	2,115	100	3,043

APPENDIX B.1

PROJECT: Indian Fisheries Development Program

BACKGROUND: In the early 1950s, India ranked in the top ten nations in the world in fish production. Most of the Indian catch, however, was freshwater fish or was taken within 15 miles of the coast, and Indian fisheries were essentially cottage industries. Fishermen were generally illiterate and occupied low socioeconomic positions. Techniques for catching, processing, and distributing fish were antiquated. Fishing vessels and gear were primitively designed and poorly constructed. There was little applied fisheries research or other scientific infrastructure in fisheries.

Beginning in 1952, the United States through the International Cooperation Administration (later AID) responded to an Indian government request for assistance to marine capture and inland fisheries, especially pond culture systems. A significant aspect of this program was to demonstrate the importance of extension services in fishery development. In both marine and inland fisheries, the United States supplied advisers, equipment, and facilities to the government of India.

ADMINISTRATION: The U.S. fisheries assistance examined here began in 1952 and continued until 1962. The following objectives guided these activities:

- Increasing the protein intake of the subcontinent's population;
- Increasing the yield of exportable fish products to help India's balance-of-payments problems;
- Improving the socioeconomic standing of fishermen.

The U.S. program in marine capture fisheries was concerned not only with fish production, but also with processing and preservation. It introduced 32 new vessels and modified existing vessels through the provision of diesel engines and outboards. Diesel engines were eventually preferred by the recipients because of their suitability to

Indian vessels and because of the lower cost of diesel fuel. A wide range of fishing equipment was provided, including winches and line haulers, nylon twine, a variety of nets, and longlines. Moreover, local manufacturing of fish netting and twine was promoted through provision of a complete net-making plant. The fish preservation and processing component called for the construction of twelve ice-making plants and two pilot fish meal plants. The United States also provided insulated or refrigerated trucks and railway vans for delivery of fish to markets.

In the fisheries extension project for inland fisheries, the United States tried to improve fish culture operations, develop new fish farms for breeding stock, and improve handling, marketing, and distribution operations. The fisheries extension project began in January 1957, following an Indian request for extension technicians. The project used audiovisual techniques to provide instruction on new methods of fish farming and for preservation and use of fish products. It also attempted to foster proper use of the new fishing equipment supplied by the project.

In both marine and inland fisheries, the United States encouraged the formation of fishing cooperatives. These cooperatives were seen as ways of reducing the control of middlemen (moneylenders), who were then viewed by U.S. advisers as hampering the improvement of living standards among artisanal fishermen.

ACCOMPLISHMENTS: During the period of U.S. assistance examined here, Indian fish production increased significantly. This derived in part from the high productivity of the coastal waters and the extremely primitive Indian artisanal fisheries (any improvements in mechanization or gear could yield large improvements in catch). In part also, the inland component of the program benefited from the extensive Indian experience and freshwater fisheries infrastructure already in place. On the other hand, U.S. assistance to India's underdeveloped pond culture systems appears to have produced no significant improvements in production. After some difficulties in promoting long-lining for tuna, U.S. advisers switched their attention to prawns. Their efforts, combined with simultaneous and subsequent projects by other donors (e.g., Norway, Japan, FAO, Colombo Plan) may have contributed to India's present highly developed shrimp export industry.

Another important consequence of U.S. assistance was the expansion of marine research and training activities by the central and state governments of India. By 1959, there were thirty-three marine research units and three technical units in the central government. At the state level, there were eight fishermen training centers, six technical labs, nine marine research stations, and six universities offering marine biology courses and carrying out marine and estuarine research programs.

QUALIFICATIONS: Various problems contributed to the mixed results of the U.S. program in India. Difficulties encountered in reaching program objectives included manpower problems, lack of infrastructure, poor organizational coordination, and state and regional differences.

India's fisheries in 1952 were primarily inland and coastal artisanal. Fishermen were predominately low-caste and illiterate, with little experience in a mechanized fishing industry. There were few trained marine fisheries personnel, and little organizational or technical infrastructure to assist fishermen. Consequently, much of the equipment delivered by the U.S. program could not be used or maintained; it either remained in storage or fell quickly into disrepair. Many vessels were used inappropriately by the state agencies, and much of the gear provided was never used. Of the twelve ice plants furnished, only two were placed in operation.

Lack of commitment and coordination by the recipient government undercut the project. The Indian government at that time was not committed to, or capable of, administering a concerted national fisheries development program. Implementation of Indian fisheries policy was hampered by delay at all levels of government, as well as by narrow state perspectives confined to licensing and revenue collecting. Interorganizational and intraorganizational coordination within and among state and central government agencies left much to be desired. Some coordination problems were resolved by the establishment of a stronger Central Government Fisheries Department, but effective coordination with state agencies was long delayed. Likewise, central government support for fisheries was lukewarm until much later, when it was decided that export of shrimp and Indian mackerel could help alleviate India's balance-of-payments problems.

Coordination also was shackled by state and regional differences in technical infrastructure and in cultural and political values. Methods and interests varied widely by state and between states and the central government, leading to a lack of unity or sense of common purpose. Many of these problems can be traced to the Indian federal system which, like the U.S. system, places primary responsibility for fisheries on the states. This situation left the central government in a weak position to implement national policies for upgrading fisheries. While the central government was concerned with a broad range of development issues, the states focused their attention primarily on immediate financial returns through licensing and revenue collecting. State resistance also undermined central government initiatives in extension services, particularly in pond culture, because the states wanted extension services to be administered through state agencies. Only careful maneuvering by central government personnel prevented the extension services from being absorbed into state organizations.

SUMMARY REMARKS: The marine and inland fisheries program in India was conceived as a comprehensive approach to fisheries development. In practice, however, the primary focus in marine fisheries was on the provision of new equipment. While the coastal waters were known to be

quite productive, resource surveys and exploratory fishing were not undertaken by the state agencies which received the vessels until later in the project. Other related areas, such as marketing, distribution, and management, were mentioned as potential targets, but few specific projects appear to have been initiated. The conservation and management infrastructure was in the hands of the states, and there were few systematic attempts to remove the institutional or legal barriers to fisheries development.

In general, the U.S. program did lead to some increases in fish production and in marine research activities. But it is unclear whether the protein intake of the Indian population increased significantly or the socioeconomic position of the fishermen improved. With regard to the other major program objective, India later increased its exports of fish products, and is now a leading exporter of shrimp. To what extent the U.S. program contributed to the export sector development that took place 10-15 years later is impossible to ascertain. A number of other donors were active in India after the U.S. program, and may have learned from earlier mistakes. Similarly, the Indian government later made a firm commitment to developing a fish export industry. Certainly this industry benefited from the previous expansion of marine research and training capabilities during the U.S. program, and from the emphasis on marine capture fisheries of that program.

In summary, the United States undertook an ambitious program very early in India's nationhood before the central government had the commitment or capability to support it adequately. The program was integrated in design but focused on provision of equipment at the outset. It was directed toward a large population of artisanal fishermen with enormously diverse languages and cultures and with limited ability to use the mechanized equipment provided. While the immediate results were disappointing because of the magnitude of the problems, the program may have laid the groundwork for later more successful efforts in Indian fisheries development.

APPENDIX B.2

PROJECT: Guinean Trawling Survey

BACKGROUND: In the late 1940s and the 1950s there was considerable local and foreign activity related to using the fisheries resources of the West African region between Mauritania and Angola. Marine research in the region was organized on a national and, to a lesser degree, regional basis by the then colonial powers, although the total marine science effort was relatively small. However, as exploitation of the resources increased rapidly during the late 1950s, there was clearly a need for a full inventory of the resources and the environmental conditions in the Gulf of Guinea.

In 1961 a concept developed earlier by the Commission for Technical Assistance in Africa (CCTA) for a "Guinean Year" was accepted by the Organization for African Unity and its Scientific, Technical and Research Commission (OAU/STRC). This concept consisted of a four-part exploration of the Gulf of Guinea, including (1) a physicochemical oceanographic survey; (2) an exploratory fishing survey for tuna; (3) an exploratory fishing survey for sardines; and (4) a trawling survey of the continental shelf.

The first of these surveys was expanded into the 1963-64 International Cooperative Investigations of the Tropical Atlantic (ICITA) conducted under the auspices of the Intergovernmental Oceanographic Commission of UNESCO. The second survey, on tuna resources, was conducted during 1963-65 by the U.S. Bureau of Commercial Fisheries. The third survey, on sardines, consisted of several national surveys supplemented by a regional survey conducted in the late 1960s by FAO and financed by the UNDP Special Fund. The fourth survey was the Guinean Trawling Survey (GTS). Thus, the GTS was one component of a concerted effort to provide baseline information on the major resources of the Gulf of Guinea with supporting oceanographic data covering the entire tropical Atlantic.

ADMINISTRATION: The principal objective of the GTS was to investigate, in relation to environmental conditions, the demersal fish potential of nearly 2,700 miles of the West African continental shelf from southern Senegal to the mouth of the Congo River.

The GTS was administered as Joint Project 19 of the Organization for African Unity/Scientific, Technical and Research Commission (OAU/STRC) and USAID under Grant Agreement 698-11-180-62C and subsequent amendments. Joint projects were sponsored by OAU/STRC to deal mainly with technical and research problems on a regional or subregional African basis.

The initial base funding provided by AID under the grant agreement was \$725,000, of which \$665,000 (92%) was for the trawling operations. It was necessary to find other funding or services in kind to cover the costs of all other aspects of the survey. This was accomplished by the OAU/STRC and the director of the GTS. (An overall breakdown of the financial support is given in Table B.2-1.)

The following operational mechanisms were used in this program:

- the use of two chartered French 35-meter commercial trawlers converted for survey operations and fishing with standard gear during two seasonal surveys (September to December 1963, and February to June 1964) at eight depths (15 to 400 meters) on 63 transects perpendicular to the coast at 40-mile intervals;
- the development of an international team of scientific personnel provided on loan from organizations in the United States, Western Europe, West Africa, and the FAO to work on board the trawlers during the survey;
- creation of a Scientific Advisory Committee consisting of experts from the United States, Europe, West Africa, FAO, and UNESCO to advise the GTS director.

ACCOMPLISHMENTS: The stated technical objectives of the project were met in full. For thirteen statistical areas between southern Senegal and the Congo River, the survey provided (a) catch rates (kg/hr), (b) density (kg/ha), and (c) standing stock (metric tons) of fish for each of eight depth zones between 15 and 400 meters.

The complete results of the GTS were reviewed at some length at the Symposium on the Oceanography and Marine Resources of the Tropical Atlantic held at Abidjan, Ivory Coast, 20-28 October 1966, and were published separately by the OAU/STRC in 1968. Later development of the resources of the Gulf of Guinea were based in part on the findings of the survey.

QUALIFICATIONS: Following completion of the GTS field work, there were considerable delays in analysis of the enormous volume of data and in report preparation. These resulted from unforeseen events outside the control of OAU/STRC, which caused funds and time to expire before some of the final steps in the preparation of the scientific reports were completed.

TABLE B.2-1 Contributions in Cash or Kind to the Finances of the Guinean Trawling Survey (1962-1966)

Source	Allocation	US\$
Funds provided by USAID under Grant Agreement	Trawling operations and project direction unit	\$727,520
United Kingdom, Ministry of Overseas Development	Director's salary, allowances, travel, etc. (part 1962-1966)	39,480
Belgium, France, Federal Republic of Germany, Ghana, Ivory Coast, Netherlands, United States, and FAO	Salaries, travel and other expenses of scientist seconded to project for total of 64 man-months	168,000
Federal Republic of Germany, United States, UNESCO	Scientific equipment	4,200
Belgium, United States, and others	Library; data analysis, etc.	11,480
West African coastal states from Senegal to Congo	Use of port facilities, duty-free customs/clearances, laboratories, etc.	23,800
Commission for Technical Assistance in Africa	Housing; office; conference facilities	32,800
OAU/Scientific, Technical and Research Commission	Publication and distribution of GTS Report	31,680
	Total	1,038,960

Numerous copies of the GTS report were published and distributed by the OAU/STRC to member countries. However, it appears from later complaints by recipient countries that an insufficient number of copies of the report were published or that they did not reach the correct repositories in the West African countries. In addition to the main report and reviews at the Abidjan Symposium, other shorter articles on the GTS should have been prepared and distributed by OAU/STRC throughout the region to both the scientific and development communities.

It is difficult to assess the ultimate developmental impact of this project because its objectives were so narrowly defined. The technical assistance rendered consisted predominately of the surveys. There was little other technical assistance built into the project. For example, training or participation by local fisheries officers was not a project

goal, although some local personnel were included in various phases of the survey work. Moreover, the project was not designed to address marketing problems or socioeconomic impacts of exploiting the stocks discovered. There was little follow-up by AID to assist coastal countries in utilizing the survey results for commercial gain through local fleets or joint ventures with outside firms. Hindsight indicates that these critical aspects were neglected, but it should be recalled that this project comprised one of a series of resource surveys undertaken by outsiders in a region where very little local expertise existed. The project could have been designed with more emphasis on building local capabilities, but it was conceived more as an urgently needed resource survey.

SUMMARY REMARKS: One of the reasons for the smooth functioning of the GTS was the relative simplicity of the administrative and financial structure of the operation. The GTS director had virtually complete independence in all affairs related to the project. He was directly responsible to the OAU/STRC and only indirectly responsible to AID (through the Scientific Advisory Committee) for the efficient functioning of the survey.

There still may be considerable merit in having AID funds delivered through regionally oriented third parties, such as OAU/STRC, which are then responsible for conducting the work with qualified personnel and with a minimum of bureaucracy. Whether the circumstances of the CCTA and its successor, the OAU/STRC, were unique in this respect is difficult to ascertain. Certainly their Joint Project 19, the Guinean Trawling Survey, appears to have been highly successful in accomplishing its scientific purposes. The broader questions of developmental benefits were not addressed directly in the original project request. These consequently received little attention, but the fundamental project objective was addressed quite effectively through this mechanism. The question remains whether the mechanism could be applied to current projects that emphasize local capability building as critical components of technical endeavor.

APPENDIX B.3

PROJECT: East African Freshwater Fisheries Project

BACKGROUND: Lake Victoria is bordered by Kenya, Tanzania, and Uganda, which respectively control 8%, 50%, and 42% of its 26,000 square miles of surface area. These three nations are partners in the East African Community, which administers the East African Freshwater Fisheries Research Organization (EAFPRO)* to assist the member states in the study and management of freshwater fisheries. Since the mid-1960s, EAFPRO has been the recipient of extensive outside technical assistance. A large United Nations project, funded by UNDP and executed by FAO, began in 1967 and was terminated in 1972 after completion of its first phase (exploratory fishing and estimates of potential yield). Expert advisers and training of local personnel were also supplied by the Norwegian, Swedish, and Canadian development assistance agencies. Some technical aid also was delivered to the individual fisheries of the member states, most notably Dutch technical assistance initiated in 1967 to the Tanzanian Freshwater Fisheries Institute.

The purpose of this technical assistance was generally to explore and quantify the offshore fishery resources of Lake Victoria, whose inshore stocks were already heavily exploited by 60,000 to 70,000 artisanal fishermen. Most of the artisanal catch was taken by a fleet of about 11,000 fishing canoes, few of which were motorized. The marketing and distribution system was mostly traditional (beach sales and fishmongers), with a few modern facilities, but was generally efficient in disposing of fresh catch. The inshore catch was declining rapidly because of overexploitation, and it was hoped by development planners that the use of larger, modern trawlers fishing offshore demersal stocks could compensate for this declining catch.

ADMINISTRATION: The stated goal of the USAID assistance program was to help the East African Community and its partner states devise

*EAFPRO was established by the United Kingdom after World War II.

long-range programs to develop, harvest, and protect fish stocks in such a way as to assure a continuous and increased supply of fish protein for the people of East Africa.

This goal was translated into a long-term program to assist EAFFRO in providing the scientific foundation for rational development and management of the Lake Victoria fisheries. The AID effort was initiated in 1973 following termination of the UNDP/FAO program. The project was originally slated to run for four years, but was later extended until 1980.

The Lake Victoria program was managed through the USAID Regional Development Office for East Africa located in Tanzania. Technical advisers were hired employees of AID. Assistance was funneled directly to EAFFRO, rather than to the national governments of its participating members. However, EAFFRO facilities were located adjacent to fisheries offices of the member states.

Most project effort during the first two years consisted of expert advisers in the field of fisheries biology. The initial project plan called for 16 man-years of expert adviser services over the course of four years, 6 man-months of consultant services, and 11 man-years of training in the United States for EAFFRO personnel. Grants were also provided for the purchase of gear and scientific equipment. The initial scientific thrust was to follow up the work of the UNDP/FAO project. Basic biological studies were undertaken, as well as fish tagging programs, experiments with different types of gear, and some economic studies on alternative development strategies for the lake's four major species. A midterm review of the scientific program was conducted for AID by consultants from the University of Rhode Island and Auburn University.

ACCOMPLISHMENTS: Only limited information was available to MTAG regarding this project; it consisted primarily of the midterm review conducted after completion of the first two years of the project. Considering that the project continued for six more years, it is impossible to gauge the project's ultimate success. No final project report is available, as the project was canceled before completion. Nonetheless, it is clear that, from its early stages, a substantial amount of expert advice and operational research assistance was provided to EAFFRO, as well as training of local personnel and some equipment and publications. AID technical assistance bridged the gap left by the termination of the UNDP/FAO program and continued in the directions set by that program. AID advisers augmented the scientific capabilities of EAFFRO and assisted in planning and conducting its research agenda. The technical capabilities assembled in EAFFRO were of benefit not only to the Lake Victoria fisheries but also to the other freshwater fisheries of the member states.

QUALIFICATIONS: The AID technical assistance was delivered to a research organization that, like many of its counterparts in the

developing world, tended to adopt a basic research orientation that did not directly address critical local development problems. The AID program at the outset focused on fisheries biology and statistics, supporting research agendas that would not have yielded results in time to address the immediate problems of resource management on Lake Victoria. AID's midterm review stressed the importance of research with immediate application to management of the rapidly growing fishing industry to prevent overfishing or destruction of local artisanal fisheries.*

The AID program never directly addressed the issue of an optimal fisheries development strategy for Lake Victoria. EAFFRO only indirectly began laying the scientific foundation for ultimate resolution of that issue through its work on the biological relation between the inshore and offshore stocks. The midterm review recommended that AID focus more directly on the social and economic effects of a trawl fishery development scheme, particularly as this would affect the artisanal fisheries. In other words, development of a qualitatively different and quantitatively much larger fishery was imminent on Lake Victoria, so that fisheries research should have complemented efforts to create an integrated development policy and management plan. EAFFRO was the organization best suited to formulating such a strategy for the entire lake, but its research was directed more toward long-term studies than immediate management issues.

In this respect, AID's approach of assistance directly to EAFFRO did not succeed in involving the national governments and fisheries departments in a consistent dialogue or working relationship that would have addressed the broader questions of cooperative development or management. There was no mention in the materials available to MTAG of other projects undertaken by AID to foster these linkages.

Moreover, the program focus on narrow technical specialties led to neglect of critical social and economic aspects of the fisheries. Some processing, marketing, and distribution studies had been done by UNDP/FAO, but these were not continued by AID during the first phase of its program. Initially there was little effort to address the marketing feasibility of an expanded offshore fishery or the social impacts this industry would have on the existing large artisanal fishing community. However, the AID midterm review suggested adding a senior economist to the project staff for these purposes.

SUMMARY REMARKS: The previous UNDP/FAO program had confirmed the existence of a relatively large and untapped offshore fishery resource in Lake Victoria that could underwrite an expanded fishing industry and

*By 1975, two new 15-meter Danish trawlers of far greater size and fishing power than locally constructed trawlers were expected to be introduced into Tanzanian waters.

enhance available local protein supplies. The AID program was intended to augment the scientific capabilities of a regional organization that would play a key role in developing and managing these offshore stocks. However, while the program certainly enhanced EAFPRO's technical capabilities, its impact on broader developmental needs was more questionable. Obviously the participants in EAFPRO had different stakes in its program: Kenya had only a small share of the lake; internal political events in Uganda sidetracked its developmental efforts; and Tanzania had the largest resource base and area of the lake. Notwithstanding these different interests, there seems to have been little effort to steer EAFPRO toward leadership in coordinating the three national fisheries strategies or in developing a coherent strategy for the entire lake. The program was thus technically competent but limited in its spillover into the key areas of fisheries management as it related to national development. More importantly, the urgency of management-related research rather than pure research appears to have been neglected.

APPENDIX B.4

PROJECT: Philippine Fisheries Development

BACKGROUND: Four projects spanning the period from 1970 to the present are discussed here. All are concerned with the culture fisheries, with emphasis on pond fish. Fish constitute the major source of animal protein in the Philippines, with per capita consumption exceeding all other major animal protein materials. Most of the fish eaten are derived from two capture (marine) fisheries: municipal (artisanal) fisheries and commercial fisheries. In 1978, the landing figures were approximately 1,000,000 metric tons (MT), 500,000 MT, and 120,000 MT for municipal, commercial, and inland (culture) fisheries, respectively. Milkfish, a saltwater species, is traditionally grown in seawater ponds from fry captured in coastal waters. Although freshwater pond culture is comparatively new to the Philippines, it has been the target of considerable development efforts by both the Government of the Philippines and foreign donor agencies. Results so far have been disappointing and there has been little net increase in pond fish produced over the last 10 years.

The U.N. has mounted several major projects concerned with (municipal) artisanal and commercial fisheries, most recently a UNDP-funded project managed by FAO in the South China Sea. This includes a number of countries in the area but is headquartered in Manila. Another important regional fisheries development is the Southeast Asian Fisheries Development Center (SEAFDEC), a regional organization largely funded by the Japanese and concerned, in the Philippines, with milkfish and other marine fish aquaculture. The organization's principal research center in aquaculture has been built in Iloilo, the Philippines. Recently, the Government of the Philippines embarked on an ambitious fisheries development program aimed at duplicating the success of its rice-farming program.

ADMINISTRATION: The AID projects reviewed are Inland Fisheries conducted from October 1970 to September 1974 at a cost of \$616,000 (No. 492-0234); Aquaculture Product Project conducted from July 1974 to September 1978 at a cost of \$889,000 (No. 492-0266); Fresh Water Fisheries Development conducted from October 1978 to September 1981 at

a cost of \$1,500,000 (No. 492-0322); and Bicol River Basin Development Program conducted from October 1973 to September 1979 at a cost of \$10,000 (No. 492-0260).

The last project is a very small part of a large sectoral development in which the fisheries work will be funded and carried out by the Government of the Philippines and AID will supply only one part-time inland fisheries expert.

The other three are linked and sequential projects aimed at the overall objective of increasing pond fish production. In the first two, Auburn University was the principal U.S. contractor; Texas A&M University was the principal contractor in the third. All three projects included significant Filipino input both in terms of money and personnel.

The first project involved the construction of two research and demonstration facilities; one for freshwater activities was sited at Munoz and was operated by Central Luzon State University (CLSU), and one facility for brackish-water studies was sited at Leganes, Iloilo, and was operated by the College of Fisheries, University of Philippines (CFUP). In addition, 12 Filipinos were trained (6 M.S. and 6 Ph.D.) at Auburn University, and approximately 30 extension workers were trained locally. The program was instrumental in development of a graduate training program in fisheries at CFUP based mainly at Leganes. The primary AID contract was with Auburn University; Government of the Philippines (GOP) funding was from the National Science Development Board and was funneled through CFUP. However, policy was formulated by an Advisory Board including Department of Agriculture personnel. Its mission also included facilitating relations between the University of the Philippines and the Philippines Fisheries Commission (responsible for extension). CLSU was brought in as a secondary participant. Some UNDP funds also were funneled for development of freshwater and brackish-water fisheries. The general purpose of this arrangement was to facilitate an increase in inland fish production by improvement of fish farming methods.

The second project also was conducted under a contract with Auburn University but involved a larger commitment of funds by GOP (including \$4,000,000 from a World Bank loan). It was an extension of the work done under the first project involving the establishment of research centers at the freshwater and brackish-water sites, initiation of research projects, additional overseas training for Filipinos (Graduate degrees: 5 Auburn, 1 University of Washington; Nongraduate: 30 at Auburn), in-country training of 300 extension workers, and demonstration training for 500 fish farmers. Auburn worked mainly with the newly formed Bureau of Fisheries and Aquatic Resources and CFUP and CLSU. However, during this period SEAFDEC constructed large separate brackish-water facilities adjacent to the facility at Leganes with excellent modern research laboratories.

The purposes of this project were to further develop the freshwater and brackish-water research facilities, to research new technical procedures for more productive fish farming in the Philippines, to assist in the development of a functioning extension system, and to increase the fish supply from pond culture.

The third project, Freshwater Fisheries Development, is the logical successor to the first two since it is a further attempt to increase fish production based on the work at Munoz and the initial attempts to organize an effective extension system. Here, Texas A&M is the principal U.S. contractor and CLSU the primary Philippine contractor.

The main thrust of this effort is to construct a freshwater hatchery for production of fry (15-20 million yearly) to be made available to farmers to stock rice paddies and fish ponds. In addition, there will be an economic study of the markets for freshwater fish, particularly in Luzon. Also, 30 Filipino extension agents will be trained in various aspects of freshwater fish production and utilization--mainly in an unidentified "third country" but presumably also at Texas A&M and in the Philippines. Fifty extension workers and 50 private-sector participants are to receive training annually at the new facility. The expectation is that these measures will result in annual production of 10,000 tons additional freshwater fish from ponds and rice paddies.

ACCOMPLISHMENTS: The principal accomplishments of the U.S.-sponsored programs during the period under review seem to have been the establishment of research and demonstration facilities and the training of university, government, extension personnel and--to a lesser extent--fish-farm operators. Unfortunately, while total fish landings have increased rapidly during the period (e.g., 1,250,000 MT in 1974 to 1,580,000 MT in 1978), virtually all the increase has come from the municipal (artisanal) marine fisheries. Nevertheless, a large number of ponds have been dug and, more important perhaps, very active development programs are continuing through the interrelated activities of the Government of the Philippines, SEAFDEC, the universities, and the International Center for Living Aquatic Resources Management (ICLARM).

QUALIFICATIONS: The AID fisheries program in the Philippines has been consistently directed toward aquaculture with little or no attention to marine fisheries. The stated reason for this focus has been that marine capture fisheries have reached the limit of exploitation and the only hope for increased production is inland fisheries. Unfortunately, this has proved consistently wrong as marine fisheries have continued to grow while inland fisheries have shown only slight change. The following table illustrates this situation.

Philippine Fish Production

	1977	1978
Inland Fisheries	100,000 MT	125,000 MT
Capture Fisheries (municipal)	670,000 MT	950,000 MT
Capture Fisheries (commercial)	<u>480,000 MT</u>	<u>500,000 MT</u>
TOTAL	1,250,000 MT	1,580,000 MT

Although the nearshore capture fisheries now appear to be close to or beyond their sustainable limit, the potential for mariculture appears barely to have been tapped.

SUMMARY REMARKS: AID has chosen to focus the Philippine fisheries effort on fish pond development. This is in line with earlier priorities of the Government of the Philippines and complements the rural development program. Until recently there has been little attention paid to marine fisheries, which carry the major burden of animal protein supply for the Filipino people. The problems of stock management and product technology are now becoming acute in these marine fisheries, and this justifies a greater U.S. AID effort in this area.

APPENDIX C

Inventory of AID Projects in Fisheries and Aquaculture

This inventory includes fisheries and aquaculture projects undertaken by AID in the ten-year period from 1969 to 1979 and projects initiated before 1969 if the funding amounted to \$100,000 or more. The projects are listed in numerical order by the AID project number.

The following information was sought for each project:

- Title
- Objectives
- Time period
- Level of U.S. funding and level and source of other funding
- Summary
- Number of U.S. and foreign personnel
- Type of equipment or knowledge transferred to the developing country
- Exchange of personnel
- Recipients
- Training programs, how many people were trained, and where were they trained
- Outputs of the project
- Abstract of the final project report

In April 1980 the first draft of this inventory was sent to the Deputy Assistant Administrator for Food and Nutrition for circulation within the AID regional bureaus. The regional bureaus were asked to review, correct, and make any pertinent modifications. Those changes have been incorporated in this version.

Complete information was not available for many of the projects. If information for a particular project was unavailable, the subject category does not appear in the inventory.

The inventory was compiled from an extensive search of AID reports and records, and additional information was supplied by Auburn University and the University of Rhode Island. Copies of documents used in this compilation are on file at the Ocean Policy Committee office.

Questions concerning any information supplied for a project should be directed to

Ocean Policy Committee
National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

AID LISTING OF PROGRAMS AND PROJECTS

<u>AID Project Number</u>	<u>Country</u>	<u>Title</u>
150-0001	Portugal	Institute of the Azores
150-0002	Portugal	Nationalized Fishing Industry Study
263-0064	Egypt	Aquaculture Development
386-0005	India	Expansion & Modernization of Marine & Inland Fisheries
391-0011	Pakistan	Karachi Fish Harbor
391-0054	Pakistan	Fisheries West Pakistan
391-0055	Pakistan	Fisheries East Pakistan
391-0096	Pakistan	Fisheries Development
391-0320	Pakistan	Agriculture Technical Support Project
409-0249	Asia Regional	Skipjack Tuna Survey
439-0065.06	Laos	Agriculture Development
442-0230	Cambodia	Fisheries Development
484-0020	Taiwan	Ocean Fisheries
489-0281	Korea	Fisheries Development
489-0594.2	Korea	Rural Policy Plan Survey
492-0266	Philippines	Aquaculture Production Project
492-0234	Philippines	Inland Fisheries
492-0322	Philippines	Freshwater Fisheries Development
493-0179.2	Thailand	Protein Food Development
493-0180.7	Thailand	Fisheries Development
493-0303	Thailand	Village Fish Pond Development
497-0001	Indonesia	Expansion of Modern Fishery Facilities
497-0189	Indonesia	Assistance to Agriculture
497-0236	Indonesia	Brackish-Water Fishery Production
497-0266-3	Indonesia	Science and Technology
497-0266-6	Indonesia	Science and Technology
497-0286	Indonesia	Small-Scale Fisheries Development
498-0214	Asia Regional	Southeast Asia Fisheries Development Center
512-2474	Brazil	Fish Production, Processing, and Marketing
513-0277	Chile	Agricultural Cooperative Development Fund
513-0296	Chile	Rural Cooperative Upgrading Grant
514-0078	Colombia	Fisheries Research
522-0124	Honduras	Nutrition
527-0144	Peru	Freshwater Fisheries Development

532-0038	Jamaica	Inland Fisheries Development
532-0059	Jamaica	Fish Production System Development
603-0002	Djibouti	Small-Scale Fisheries Development
615-0130	Kenya	Fisheries Development
618-0649.2	East Africa	Freshwater Fisheries
620-0212	Nigeria	Agricultural Planning & Advisory Services
620-0704	Nigeria	Fisheries Development
631-0022	Cameroon	Small Farmer Fish Production
641-0028	Ghana	Volta Lake Technical Assistance Project
649-0006	Somali Republic	Fisheries
657-0006	Guinea-Bissau	Development of Small-Scale Fisheries Sector
660-0056	Zaire	Fishing Cooperative Expansion
660-0080	Zaire	Fish Culture Expansion
669-0003	Liberia	Freshwater Fisheries
685-0240	Senegal	Lowland & Fish Culture Project
695-0102	Burundi	Highland Fisheries Development
696-0112	Rwanda	Fish Culture
698-0620	Africa Regional	The Guinean Trawling Survey
730-0317	Vietnam	Fisheries
931-0042	Brazil	Fisheries Training Center
931-0113		Institutional Development Grant 211(d) to International Center for Marine Resources Development (ICMRD), URI
931-0120		Institutional Development Grant 211(d) to International Center for Aquaculture, Auburn University
931-0242		NOAA Advisory Services
931-0526		Artificial Propagation of Milkfish-Oceanic Foundation
931-0787		Increasing Fish Production by Improved Fishcultures-Basic Ordering Agreement with Auburn University
931-1050		Fisheries Development, ICLARM
931-1155		Small-Scale Fisheries Development Conference - University of Miami
931-1156		International Management Study Group-Southeast Asian Fisheries Development Center (SEAFDEC)

931-1306

Fisheries and Aquaculture
Collaborative Research in the
Developing Countries, Title
XII--Resources Development
Associates

931-1155

International Workshop on
Tropical Small-Scale Fishery
Stock Assessment

931-1314

Aquaculture Technology
Development Auburn University

150-0001 Portugal

Institute of the Azores

Objectives: To provide technical advice and assistance in stock assessment, experimental fishing training and statistics to Institute of Azores in agriculture and fisheries.

Time Period: 1977-79

Level of U.S. Funding: \$170,000

150-0002 Portugal

Nationalized Fishing Industry Study

Objectives: To conduct a comprehensive study of stock assessment and experimental fishing training.

Time Period: 1977

Level of U.S. funding: \$150,000

263-0064 Egypt

Aquaculture Development

Objectives: To assist the Government of Egypt through the Subministry for Aquatic Resources of the Ministry of Agriculture to establish a research and extension capability and increase the size of production ponds, thereby increasing the supply of high protein foods available to the Egyptian consumer.

Time Period: 5/79-4/84

Level of U.S. Funding: \$27,500,000

Other Funding: Egyptian government \$4 million

Summary: This project will accomplish its goal by providing the capacity for sustained development of the fish farming industry on an economic basis through improved institutions for planning and coordination, applied research, training, and extension. This capacity will support fish farming on roughly 50,000 feddans. The project will directly increase annual fish production by at least 4,000 tons by 1986 through the establishment of a large model fish farming area, a revolving credit fund, and the adaptation of small farmer technologies to Egypt.

The project has two components--an institutional component and a production component. The institution component will provide the training, extension, applied research, and other support necessary to develop the fish farming industry.

The project will establish

1. a National Fish Farming Center at Abbasa, Sharkia, to conduct training and applied research and provide extension services to the aquaculture industry
2. a 1,200 feddan production area adjacent to the Center
3. an additional 3,800 feddans of fish farms in the Sharkia-Ismailia area
4. two additional carp hatcheries
5. two additional mullet fry collection centers on the coast
6. a mullet hatchery at Al Gameel

Number of U.S. Personnel: 6

Number of Foreign Personnel: 128 researchers and laborers

Exchange of Personnel: Technical assistance will be administered primarily through a host country contract. The Under-Secretary for Aquatic Resources is the project director responsible for supervision of the contract with assistance of a USAID project officer.

Recipients: The ultimate beneficiaries will be the consumers of the fish produced. A second group of beneficiaries will be the homestead farmers, other private farmers and those employed as laborers and watchmen in fish production.

Training Programs: 45 individuals receive long-term training. 30 individuals receive short-term training. Training will be provided in a range of specialities including pond engineering and fish farm management as well as in aquaculture and fisheries biology.

Outputs: Creation of aquaculture support institutions and establishment of 5,000 feddans of private fish farms.

386-0005 India

Expansion and Modernization of Marine and Inland Fisheries

Objectives: To augment the diet of the population and to increase the yield of exportable products; to conduct an exploratory fishing program to determine the species of fish available in India and the most efficient method of capture.

Time Period: 5/52-6/62

Level of U.S. Funding: \$2,902,000

Summary: This activity was directed toward assisting the Indian Ministry of Food & Agriculture and the Indian states in schemes designed to improve the diets of the people and the economy of the villages. Vessels furnished under the project were grouped into four fishing fleets where foreign advisers were located to ensure proper utilization.

Number of U.S. Personnel: 9 advisers for a total of 185 man-months

Type of Equipment or Knowledge Transferred: Vessels, vessel equipment, net and twine plants, extension and audiovisual equipment, technological equipment, engines and outboard motors, ice plants, and cold storage equipment.

Training Programs: 16 individuals for a total of 125 man-months in fish migration, fishery research, fisheries by-products, sardine investigation, spawning, deep sea fishing, mechanized fishing; 74 crew members trained by U.S. advisers.

Report: Five end of tour reports.

391-0011 Pakistan

Karachi Fish Harbor

Time Period: 3/53-9/59

Level of U.S. Funding: \$472,000

391-0054 Pakistan

Fisheries West Pakistan

Time Period: 3/55-6/62

Level of U.S. Funding: \$560,000

391-0055 Pakistan

Fisheries East Pakistan

Time Period: 3/55-6/62

Level of U.S. Funding: \$179,000

391-0096 Pakistan

Fisheries Development

Objectives: To contribute to the development of fisheries for the nutritional and economic welfare of Pakistan and especially E. Pakistan. In 1955, the objective was to provide an exploratory fishing vessel for use in the systematic survey of the Bay of Bengal to determine how much the fishery can be expanded with proper gear and equipment. The 1957 project agreement states that the project will continue assistance in development of the fishing industry in E. Pakistan by helping to determine the productivity of the fishing grounds and determine the most practical fishing methods, types of boats, gear and shore processing facilities in order to demonstrate to private enterprise the profitability of this field of enterprise.

Time Period: 3/55-6/62

Level of U.S. Funding: \$99,000

Summary: The project began on March 16, 1955, and phased out on June 30, 1962. It was an E. Pakistan project 391-0055 until November 1959, after which it was consolidated with W. Pakistan as AID project 391-0096.

Number of U.S. Personnel: 1 USAID technician for period 2/57-9/62.

Type of Equipment or Knowledge Transferred: Exploratory fish boat mechanization, use of synthetic twines, refrigerated fish market, mechanized fish dryers, and pond weed control.

Training Programs: 9 participants trained, 5 in marine fisheries and 4 in inland fisheries.

Outputs: Introduction of a 160-ton exploratory boat, fish boat mechanization, use of synthetic twines, refrigerated fish market, mechanized fish dryers, and fish pond weed control. Advisory service to government of Pakistan in development organization, private capital investment, fish harbor planning and a ten-year marine fisheries development plan for E. Pakistan.

Report: End of tour report, Ralph L. Johnson

Project introduced 7 subprojects involving commodity assistance and overseas training. The major activity was advisory service to government (of Pakistan) administration as it related to government and private sector fishery development efforts.

When the USAID technician arrived, the cooperating host government department (CFD) was only three years old, which created some problems.

Construction of the exploratory boat did not occur until the end of the project period (June 1962). Assistance from the Japanese was obtained.

Concentration applied to two objectives: 1) to create organization solely for fishery development in E. Pakistan and 2) to attract private sector investment to the fishing industry.

Four proposals were submitted during 1958-60 for the consideration by the Government of Pakistan. The first three were not adopted; the fourth was adopted in 1961.

Project technician established early rapport with Pakistan counterpart who was trained in the United States. Project was well received by host government. Effort was made to extend the project.

391-0320 Pakistan

Agriculture Technical Support Project

Objectives: To develop Pakistan's agricultural sector; assess possible strategies and projects for agricultural development.

Time Period: 8/68-9/74

Summary: One study under this project is to stimulate interest in development of deep-sea fishing industry. A potential research project evaluated for E. Pakistan agricultural university.

Number of U.S. Personnel: 1 U.S. fisheries specialist for 2 man-months

409-0249 Asia Regional

Skipjack Tuna Survey and Assessment Program in the Central and Western Equatorial Pacific Ocean

Objectives: To provide funding to this multinationally funded research project being conducted by the South Pacific Commission.

Time Period: 7/77-9/80

Level of U.S. funding: \$450,000

Summary: Provides partial funding to multifunded project. Objectives of the project are to conduct studies to 1) obtain

a better understanding of migrations and stock structure of skipjack tuna; 2) to determine the distribution and availability of skipjack tuna and baitfish; and 3) obtain better knowledge of the population dynamics of skipjack tuna stocks. Other donors are New Zealand, Australia, United Kingdom, France, and Japan.

Number of Foreign Personnel: 12 people on staff

Recipient: South Pacific Commission

439-0065-06 Laos

Agriculture Development

Objectives: To develop a Laotian Fisheries Service capable of producing fingerlings in sufficient quantity to meet fish production requirements and of providing services to Laotians engaged in fish culture. To improve existing fish hatcheries and train Fisheries Service personnel in the operation of fish station and Agriculture Extension Service personnel in fish culture in rice paddies and farm fish ponds.

Time Period: 10/65-9/74

Level of U.S. Funding: \$700,000

Summary: AID contract with U.S. Consultants, Inc. Project emphasizes participant training, fish culture assistance to refugee villages, and hatching eggs produced at the three basic fish hatcheries.

Type of Equipment or Knowledge Transferred: Purchase of commodities - cement, general supplies, and miscellaneous small purchases. Transfer of fish culture knowledge.

Training Programs: 40 participants over 4 years for a 12-week course. 4 participants over 2 years period for 8-week course. 10 participants over 5 years for university degrees. On-the-job training for station personnel.

Outputs: Rehabilitation of three fish hatcheries.

442-0230 Cambodia

Fisheries Development

Objectives: To delineate the problems related to fish production and to make appropriate recommendations.

Time Period: 5/58-6/67

Level of U.S. funding: \$180,000

Summary: This was a joint Cambodian-U.S. Operations Mission (USOM)/Cambodia Fisheries Conservation Project.

Number of U.S. Personnel: 2 Technicians

Type of Equipment or Knowledge Transferred: 2 diesel engines, 4 steel boats transferred. Knowledge of freshwater fisheries.

Training Programs: 4 participants sent to the U.S. for 4 years of academic training in fisheries biology and management. An in-service training program planned for two Cambodian technicians, but both transferred to higher paying jobs.

Outputs: 1) Recommendations to the Cambodian government on fisheries resources, 2) Biological investigation into decline of Cambodian fish production.

Report: End-of-tour reports from G. D. Ginnelly and J. Bardach.

484-0020 Taiwan

Ocean Fisheries

Time Period: 6/55-6/59

Level of U.S. Funding: \$170,000

489-0281 Korea

Fisheries Development

Objectives: To plan and implement a program which would increase the fisheries production for domestic use and export by 1) providing materials and equipment to rehabilitate the fishing fleet and shore installations; 2) training fishermen to use improved methods and equipment; 3) establishing a system to enable fishermen to finance their operations and the investments necessary to rehabilitate and develop the

fisheries industries; 4) developing marketing procedures and facilities to distribute fisheries products economically; 5) developing improved handling, preservation, and processing to raise the standards of quality fisheries products; 6) developing the freshwater fisheries potential of the country; and 7) training government officials in improved methods, procedures, and administration.

Time Period: 5/56-6/64

Level of U.S. Funding: \$4,662,000

Summary: This project is a continuation of programs of other organizations to develop the fisheries of Korea by providing materials for boat construction, fish markets, processing, freshwater and saltwater fish propagation, introduction of improved equipment, and the training of fishermen in their use and the establishing of a Fisheries Credit System to assist the fishermen with operating loans.

The project developed on the basis of successive fiscal year agreements each funded to accomplish specific goals related to the overall objectives. In FY 56, AID and Korea paid for commodities and utilization costs for constructing commercial fishing vessels (362 boats); fishing gear and equipment; commodities and utilization costs to improve the facilities of Central Fisheries Experiment Station. In FY 57, AID and Korea paid for handling costs for offshore procurement of deep sea fishing vessels (7 vessels); commodities and local costs for boat construction (178 vessels); commodities and laboratory and pilot plant equipment for the station; commodities and local costs for construction of wholesale fish market center at Pusan; commodities and local costs for demonstration retail fish markets; and Korea financed the establishment of the Fisheries Revolving Loan Fund. In FY 58, there was no commodity or counterpart funding. In FY 59, AID and Korea paid for commodities and local costs for fishing boat modernization and repair (46 marine engines); for commodities and local costs for continuing demonstration and training activities; Pusan fish market commodities; and Korea financed local costs for rehabilitation of fish hatcheries and an addition to Fisheries Revolving Loan Fund. In FY 60, AID paid for lumber and marine engines to replace small fishing boats lost or destroyed by typhoon Sarah; AID and Korea financed construction of modern combination fishing vessels; demonstration and training equipment; construction of a 70-ton research vessel; construction of two inland fish-freezing ice and cold storage facilities and rehabilitation of two fish hatcheries. In FY 61, AID and Korea supported project advisory, demonstration and training facilities.

Number of U.S. Personnel: 8 technicians

Type of Equipment or Knowledge Transferred: Materials for boat construction and procurement of boats constructed outside of Korea. Modern equipment and gear consisting of long-line, shrimp trawl, lampara seine, purse seine, and other trawl.

Training Programs: A school was established to train Korean instructors to assist fishermen in the installation, operation and maintenance of diesel engines for 40 days. Seventeen participants trained in the U.S.

Outputs: 1) Increase the production of fish and marine products to an annual average of approximately 450,000 metric tons; 2) develop an adequate system of marketing and distribution of marine products; 3) develop adequate standards of quality and techniques for handling and processing fresh and preserved marine products for domestic markets and exports; 4) develop the skills of administration to reduce the costs of production and distribution and to properly preserve the catch; 5) develop a workable fisheries credit system; 6) develop modern boat building and mechanization of the fishing fleet.

Report: 9 end of tour reports.

489-0594-02 Korea

Rural Policy Plan Survey

Objectives: To increase fishermen's income and the protein content of the Korean diet.

Time Period: 1963-1974

Summary: Activities were directed at 1) bringing attention to the importance of fisheries in Korea and their potential for development of the country; 2) getting into operation the fish markets at Pusan, Masan, and Gosu; 3) encouraging private enterprise, particularly American companies, to invest in Korea's fisheries.

Number of U.S. Personnel: Senior fisheries adviser

Training Programs: Participants to be trained

Outputs: Adviser to analyze production/marketing programs, identify new sources of fish and income for fishermen, develop an export policy, formulate technical assistance and training needs, analyze investment potential for public and

private sources. Fish hatchery facilities put into operation and sanitation in shellfish beds to be raised to international standards.

Report: Two end-of-tour reports, and A Development Plan for Fresh Water Fisheries in the Han River Basin; A Survey of the Fisheries Research Program of the Republic of Korea, by Philip M. Roedel and Parker S. Trefethen.

492-0266 Philippines

Aquaculture Production Project

Objectives: To increase brackish-water and freshwater aquaculture production and small fish producer incomes. To increase agricultural production by strengthening agricultural research and extension capabilities so that more fish protein would be available to improve the nutrition of the population.

Time Period: 7/74-9/78

Level of U.S. Funding: \$889,000

Other Funding: GOP \$4,600,000

Summary: The Aquaculture Production Project (APP) undertaken by the Government of the Philippines with assistance of USAID as a follow-up to the Inland Fisheries Project (IFP) which began in 1971 and ended in 1974. The IFP focused on establishment of two aquaculture research centers. The APP's focus was on the establishment of a pilot aquaculture extension program in the Bureau of Fisheries and Aquatic Resources (BFAR), continued development of brackish-water and freshwater fisheries and intensified research activities linked to and coordinated with the extension program.

Number of U.S. Personnel: 1 extension adviser, (4 yrs.), 2 research advisers (2 yrs.), short-term advisers.

Type of Equipment or Knowledge Transferred: Motor vehicles, education, field equipment, and lab equipment.

Recipients: Beneficiaries are poor and inland fish producers.

Training Programs: 300 extension workers trained
500 fish producers received orientation in new technology
6 participants graduate training abroad
10 participants non-degree training abroad

Report: End of project evaluation by Dr. James Avault, Jr., Louisiana State University; Dr. Wallace Klussman, Texas A & M University; and Dr. R. O'Neal Smitherman, Auburn University, September 9-23, 1978.

Project Accomplishments

1. Goal to improve nutrition of Filipino poor and increase incomes of poor inland fish producers.
 - a) National consumption of pond raised fish increased from 3.0kg per capita per yr. in 1973 to 4.0kg per year in 1978.
 - b) Net income of fish producers adopting and using technologies recommended by the brackish-water and freshwater research centers increased by 20 percent.
2. Project Purpose to increase brackishwater and freshwater fisheries production.
 - a) Purposeful research completed and results published; extension workers developing and testing new technology; training programs being conducted for extension personnel; new technologies publicized among fish producers; and fish producers are using improved technologies.
 - b) Milkfish production increased in Regions V and VI.
 - c) National freshwater fisheries annual production increased from 4,000 MT in 1971 to 15,000 MT by 1978.
3. Project Outputs
 - a) Extension systems in Regions V and VI staffed with a total of 50 or more personnel, equipped and in operation by June '77; extension systems in each of the other regions strengthened by two or more personnel.
 - b) At least 10 priority research projects completed by the brackish-water and freshwater centers in key problem areas by June 1978.
 - c) Training completed by September 1978: 300 extension workers trained; 500 fish producers recieved orientation on new technology. 6 participants received a total of 90 PM graduate training abroad and 10 participants received a total of 60 PM non-degree training abroad.
4. Project Inputs
 - a) AID - technical assistance, participant training, equipment commodities and supplies. Assessment--project inputs delivered in a timely manner, except USAID supplied jeeps from excess property, which often were not in satisfactory condition when delivered.

Conclusion of authors: project a definite success. High output and achievement obtained relative to AID funding.

492-0234 Philippines

Inland Fisheries

Objectives: Establishment of two viable and effective research and training centers capable of providing the level of expertise necessary to backstop the inland fishing industry. Long-range objectives are 1) to increase the availability of fish for consumption; 2) to decrease the need to import fish to meet domestic requirements; 3) to diversify and raise income levels of Filipino farmers; and 4) to stimulate the domestic fish industry of the Philippines.

Time Period: 10/70-9/74

Level of U.S. Funding: \$616,000

Other Funding: (pesos) 1,147,608

Summary: Through a contract with Auburn University, one freshwater research facility and one brackish-water research facility established. These when purposes were achieved: 1) two research training centers in operation; 2) improved quantity and quality of fishery products for domestic consumption; 3) improved control of parasites and disease in local fishponds; 4) improved breeding technology and methodology and hatchery techniques for certain species; 5) export potential developed.

Training Programs: 12 participants--all received masters degree, 6 received PhDs. 30 Filipino extension workers trained in pond construction.

Outputs: Research projects, extension, and graduate training in fisheries.

Report: AID Project Appraisal Report, 1/75. Successor Aquaculture Production Project begins FY 75. Auburn rated highly. Graduate training participants performance good to outstanding. All will receive masters, 6 PhDs. Delay in receiving some commodities, some not according to specifications, parts missing, quality not good. Bureau of Fisheries less than fully cooperative in implementing training programs, providing extension personnel and generally recognizing research center's activities and results. Forty research projects conducted and reported on. Thirty extension workers and fish pond operators trained. Seven extension leaflets prepared for publication. Outgrowth of project is implementation of graduate program in fisheries at the University of the Philippines.

492-0322 Philippines

Freshwater Fisheries Development

Objectives: To increase freshwater aquaculture production, to increase incomes of small farmers and small fish producers, and to improve nutrition. To increase the supply of freshwater fish seedlings; distribution of fish seedlings to rice farmers and to small-scale fish pond operators; improving the flow of aquaculture information to farmers; and assisting farmers to produce fish.

Time Period: 10/78-9/81

Level of U.S. Funding: \$1,500,000

Other Funding: (pesos) 13,572 Bureau of Fisheries & Aquatic Resources

Summary: This is a five-year project with AID input of technical assistance, commodities, project management and evaluation and participant training during the first three years. Services of a project manager to be obtained from the U.S. Fish & Wildlife Service paid for with grant funds. Technical support and advisory services to be obtained through direct AID contract with Texas A&M University.

Number of U.S. Personnel: 4 person-years of full-time technical assistance; plus consulting services short term.

Type of Equipment or Knowledge Transferred: Equipment and furnishings, vehicles, office equipment, maintenance and shop equipment, hatchery equipment and supplies, and training equipment and supplies.

Recipients: Small rice farmers and consumers.

Training Programs: 8 participants trained in modern freshwater fish hatchery production and management in third country. 2 participants trained in modern freshwater fish utilization marketing and/or product development. 20 participants trained in freshwater fish pond and hatchery construction.

Outputs: 1) Establishment of a freshwater fish hatchery-extension training center (FFH-ETC) with professional capabilities of providing the extension linkage between researchers and field extension agents; 2) an effective system to provide information and technical assistance to farmers in freshwater fish production technology; 3) Central Luzon should have an established capacity to produce 60 million fingerlings annually; 4) annual fish production should have increased by

an estimated 3,200 metric tons; 5) some 7,500 low-income rural families to have more nutritious diets and higher incomes.

493-0179.2 Thailand

Protein Food Development

Objectives: To develop inexpensive high-protein food supplements to reduce malnutrition in preschool children and weanlings in northern and northeast Thailand.

Time Period: 10/68-9/72

Level of U.S. Funding: \$225,000

Other Funding: \$325,000

Summary: This three-year project has three phases: 1) research and develop a variety of inexpensive high-protein food supplements from local foods with emphasis on marine fish and high-protein vegetables; 2) test these products in the field for suitability and acceptability and in the laboratory for human biological value; and 3) provide initial stimulus for local commercial production, promotion and marketing of acceptable products.

UNDP, FAO, UNICEF, Peace Corps, and SEATO also conducting major in-country food technology programs to assist Government of Thailand agencies in research and development and commercial food supplement production.

AID mission inputs are limited to selected commodities such as vehicles, food processing and laboratory equipment, participant training, and short-term consultants.

Leroy S. Christy, a fisheries consultant, contracted to conduct a preliminary assessment of the potential for further development and commercial exploitation of processed and preserved fish products.

A national seminar for Protein Food Promotion held Nov. 22 - Dec. 1, 1970 organized by the National Academy of Sciences.

Number of U.S. Personnel: Short-term consultants

Type of Equipment or Knowledge Transferred: Equipment - baking oven, meat mincer and cutter, portable agitators, spray dryers, solid processor, pilot plant flakers, vacuum dryers, twin drum dryers, steam kettle, vacuum cooker

Recipients: Poor people of northern and northeast Thailand

Training Programs: 7 participants trained, 4 in nutrition and 3 in food technology.

Participant training program for 7 weeks, 5 people to observe breeding, feeding, pasture development, farm machinery, grain storage and handling systems, marketing and slaughtering, research and experiment stations, artificial insemination, and distribution centers.

Outputs: 1) Stimulation of one or more private industries to produce and market acceptable inexpensive high-protein foods; 2) provide a permanent vehicle for delivery of applied nutrition services, family planning and health education to rural population through opening of village child daycare centers; 3) produce a small corps of well trained professionals in fields of nutrition, food technology, and related sciences; 4) create a permanent atmosphere of coordination and interreliance between various ministries and agencies aimed toward solving the problems of human nutrition.

Report: Two reports by fisheries consultant, Leroy Christy - "Fish and Fish Products in Thailand's Nutrition Program."

Also, "Report of a Seminar on Protein Food Promotion, Bangkok, Thailand, November 22 - December 1, 1970." NAS Seminar

493-0180.7 Thailand

Fisheries Development

Objectives: To increase freshwater fish production and to improve living conditions of population of north and northeast by providing more protein in local diet and an additional source of income for farmers.

Time Period: 9/67-10/73

Level of U.S. funding: \$279,00

Summary: Contract with Auburn University. This project supports the creation of a strong active fish farming business with supportive extension educational and training programs in fish rearing, fish culture, and fisheries management.

When project purpose achieved 5,000 farmer owned ponds producing fish; a fishery stations staffed and equipped; 18

mobile fisheries extension teams operative; fry and fingerling production increased 20%; and Ubon Ratana reservoir producing 4,000 tons in food and \$20 million in income.

Number of U.S. Personnel: 5 technicians (Auburn)

Type of Equipment or Knowledge Transferred: Laboratory equipment, knowledge of freshwater fish production.

Recipients: People of the north and northeast Thailand

Training programs: 17 technical personnel trained in United States. 36 mobile team personnel trained. 4 participants trained in fish culture.

Outputs: 1) Key technical personnel trained; 2) 18 mobile fisheries extension teams established; 3) 36 mobile team personnel trained; 4) U.S. trained technicians to fill administrative position; 5) fishery and Ubon Ratana reservoir stations equipped with laboratory equipment.

493-0303 Thailand

Village Fish Pond Development

Objectives: To facilitate the establishment of multipurpose fish ponds in northeast Thailand in order to increase animal protein supplies and availability of water for domestic and livestock consumption. To establish 28 village fish ponds in depressed rural areas of north and northeast Thailand which will benefit 2,800 families.

Time Period: 9/79-7/81

Level of U.S. Funding: \$442,000

Other Funding: RTG \$421,000

Summary: FY 79 program plans for establishment of multipurpose fish ponds; established; efforts initiated to organize pond use groups and train villagers in techniques for operating and managing ponds, as well as extension activities relating to secondary uses of pond water; fish fingerlings to be produced to supply pond user groups. Input costs covered by USAID grant relate to a) contracts for earth moving, b) materials for the outlet control and the shelter, c) labor attained from communities, and d) subsidies to the local fisheries stations for specific seed fish production, inspection tests and training programs. Thailand Department

of Fisheries provides for acquisition of land for ponds where necessary, for program supervision and management, and for field personnel.

Number of Foreign Personnel: Senior staff member of Thai Department of Fisheries to supervise and administer project.

Recipients: Rural people forming communities where 28 impoundments are developed.

Outputs: 1) 28 multipurpose fish ponds; 2) A local supply of animal protein adequate to meet the dietary needs of the people; 3) Contributions to rural self-sufficiency; 4) Inspiration for the widespread implementation of similar ponds at other rural communities; 5) Demonstrations of components that could be included as part of the national program to develop model cooperative villages in each province of Thailand; 6) Workshop programs that introduce the principles and techniques of fish culture and integrated farming to rural people.

497-0001 Indonesia

Expansion of Modern Fishery Facilities

Time Period: 6/51-6/64

Level of U.S. Funding: \$613,000

Report: End of tour report, L. E. Wakefield, Nov. 15, 1960, to Nov. 15, 1962.

497-0189 Indonesia

Assistance to Agriculture

Objectives: To assist in the development of new agricultural programs and policies and to increase the DOA agencies' capability to design and implement programs and policies.

Time Period: 1969-2/81

Level of U.S. Funding: \$2,683,000

Summary: The project has three major areas: 1) farmer education and information services, 2) seed improvement, production & distribution, and 3) fertilizer and pesticide distribution.

This project provided for a team from Auburn University in 1975 to do a technical appraisal of a proposal for an inland brackish-water fisheries industry in northern Sumatra. AID grant funding of \$559,000 provided for technical assistance, commodities and participant training. The goal of this subproject was to increase fish production with benefits reflected in higher net income to producers, expansion of fish production areas, increased employment, and greater availability of pond raised fish and shrimp.

Number of U.S. Personnel: For fisheries: 48 man-months; one individual stationed in each 2 provinces for a 2-year period. Short-term consultants, 12 man-months.

Type of Equipment or Knowledge Transferred: Transportation equipment (land and water) and office and scientific equipment (fisheries).

Training programs: For fisheries subproject: In country and offshore academic and short course training provided to provincial staff members of Fisheries Department.

Outputs: Development of a brackish-water fisheries project for provinces of North Sumatra & Aceh.

497-0236 Indonesia

Brackish-Water Fishery Production

Objectives: To increase brackish-water (tambak) fisheries production in seven kabupatens in the provinces of Aceh and North Sumatra and to create a project organizational base upon which tambak area expansion can take place.

Time Period: 10/74-9/79

Level of U.S. Funding: \$389,000

Summary: Contract AID/ASIA-C-1177 with Auburn University. a) Tambak fish production doubled with benefits reflected in higher net income for producers; b) 2,300 additional tons of fish available to local consumers; c) increased farm employment; d) infrastructure in place to support tambak area expansion; e) a tambak expansion plan completed.

Number of U.S. Personnel: 2 advisers

Type of Equipment or Knowledge Transferred: Technology introduction and intensified extension activities.

Recipients: Local consumers, full-time farm laborers, poor fish farmer families, middle-income fish farmer families, wealthy fish farmer families, area merchants.

Training Programs: Four long-term participants in U.S. and the Philippines; two participants, 3-month training programs in Philippines; 23 project staff received 69 man-months of training at Jepara, Central Java. Provincial fishery development units (PFDU) staff received 139 days of training in extension methodology by Auburn specialist. Other staff trained by provincial project staff.

Outputs: Trained staff; increased production; new employment created; 8 provincial fishery development units established.

Report: Auburn Annual Report, by Bryan L. Duncan and Michael C. Cremer, 12/10/77. First annual report covers period 11/1/76 to 10/31/77 by Duncan and Cremer on 2-year assignments with the Indonesian Directorate General of Fisheries. Discusses progress toward accomplishing each output listed below.

1. Fry resources evaluated in Aceh and N. Sumatra and improved capture and distribution programs operational in Aceh and N. Sumatra.
2. Government policy change making fertilizer available at reasonable cost to pond operators has increased fertilizer utilization by producers.
3. Increased lending by GOI Bank Rakyat and/or other lending institutions for fishpond production and development.
4. Provincial program operational with technical assistance; 8 PFDUs established and operational in demonstrating improved production systems, and TIAs providing guidance to farmer.
5. Trained staff functioning with technology and methodology for intensification outreach program.
6. Annual production from existing tambaks in the two provinces doubled.
7. New employment created for underemployed agricultural and fishery families.
8. Greater role for local producer associations in development.
9. GOI infrastructure in place and functional to handle intensification for the remaining 12,300 hectares of current tambak and capable of furnishing advice to new fish farmers as they are settled on the remaining 125,450 hectares of potential tambak land.

497-0266-3 Indonesia

Science & Technology

Subproject #3 - Aquatic Resources Development

Time: 6/1/79-4/1/83

AID funding \$1,286,000

Counterpart \$700,000

Purpose: To develop cooperative oceanography program of the Indian Institute of Oceanology (LON) and Pattimura University as they collaborate for the benefit of local fishermen and boat builders.

- Objectives:**
1. To assist in development of aquatic resources instructional programs of Pattimura University.
 2. To assist in developing a staff that can conduct effectively marine research, public service, and teaching programs of Pattimura University and to a lesser degree at LON/Ambon field station.
 3. To develop aquatic research and information programs relating to a) little-known or unexploited marine organisms in region; b) protective ecology which would prevent overfishing, destruction of coral reefs, pollution and protection of bait fish; c) exploitation of seaweed; and d) similar programs.
 4. To develop marine resource-related appropriate technology program in order to improve the tools being used by the rural poor.
 5. To develop an aquatic instrument and equipment repair system which would interrelate with the National Instrumentation Institute.
 6. To assist in developing at Pattimura a series of public information programs that will disseminate information needed by local people to exploit marine resources.
 7. To assist in developing instructional programs by providing more relevant instructional materials and library resources.

Number of U.S. Personnel: (technical assistance)

Long-term - 1 technical expert in marine science for 2 years.

Short-term experts:

- a) library science in marine sciences (4 mos)
- b) marine science instrumentation (6 mos)
- c) fisheries development expert (6 mos)
- d) oceanography expert (4 mos)
- e) backstop support officer (6 mos) and secretary (3 mos)

Training Programs:

In U.S.

- a) Eight participants for total 24 mos. nonacademic in instrumentation, data processing, and library science.

b) Six people for total 14 years of graduate academic training in marine sciences.

In-country

a) Six seminars of 1 to 3 months duration each for total 14 mos.

b) Ten participants for total 24 years of graduate academic training.

Type of Equipment or Knowledge Transferred: Scientific equipment, instructional materials, library books total \$320,000

497-0266-6 Indonesia

Science and Technology

Subactivity #6 - Weather Forecasting for Fishermen and Farmers

Purpose: To develop a system to forecast weather for Indonesian fishermen and farmers.

Level of U.S. Funding: \$980,000

Other Funding: 800,000 GOI

Summary: Possible Participating Agency Service Agreement (PASA) with NOAA to work with the GOI Center for Meteorology and Geophysics, Ministry of Communications

Inputs: NOAA expertise for technical assistance and local training; purchase of selected equipment, and limited training and education in the United States. GOI provides counterpart personnel, local costs for NOAA staff or consultants involved in the project

Outputs: A study of the present weather forecasting and communications situation; an analysis of potential ways to establish an effective forecasting system; a joint selection of the most cost effective system, and the development and initial steps in the establishment, testing, and demonstration of such a system.

Number of U.S. Personnel: 1 full-time specialist, 4 person-years; 2 part-time specialists each year, 4 person-years.

Type of Equipment or Knowledge Transferred: \$200,000 for commodities and data processing

Training Programs: 3 Indonesians

497-0286 Indonesia

Small-Scale Fisheries Development

Objectives: To increase the quantity, quality, and variety of fish available for human consumption and to increase income and employment for small-scale fishermen.

Time Period: 6/78-5/81

Level of U.S. Funding: \$1,500,000

Other Funding: GOI \$1,000,000

Summary: This project seeks to develop alternatives for application in Indonesia by the many poor fishermen and small producers. A feasibility study by the University of Rhode Island was completed in September 1978. (AID Funding). Assisting small-scale fisheries is a high priority of the government of Indonesia.

Number of U.S. Personnel: 219 man-months of technical assistance

Type of Equipment of Knowledge Transferred: Extension and training aids, equipment, machinery, and vehicles. Knowledge of applied research transferred.

Recipients: Primary beneficiaries will be the 2 million small-scale fishermen with an average annual income of \$215. Rural and urban consumers will also receive major benefits from access to more abundant reliable sources of fish protein.

Training Programs: 90 man-months of training

Outputs: Pilot ice plant; fishery management system and trained personnel; research and demonstration floating fish cages; freshwater shrimp research and demonstration stations and trained staff; improved hatchery.

498-0214 Asia Regional

Southeast Asia Fisheries Development Center

Objectives: To increase the food supply, particularly dietary protein, and improve the nutritional standards in S.E. Asia and also to develop marine fisheries.

Time Period: 10/69-9/73

Level of U.S. Funding: \$285,000

Summary: Proposed by Japan to increase the production of food from the sea in Southeast Asian countries through applied research and training. Center came into existence in January 1968 when agreement between Japan, Malaysia, Philippines, Singapore, Vietnam, and Thailand was signed. Research Department started operations in mid-1969 with arrival in Singapore of 21 Japanese research advisers and a Japanese research vessel. Training Department located in Bangkok. AID's input includes laboratory equipment, books and fishing gear.

Number of Foreign Personnel: 21 Japanese research advisers

512-2474 Brazil

Fish Production, Processing, and Marketing

Objectives: To establish within the Departamento Nacional de Obras Contra a Secas (DNOCS) the capacity to carry out research and upgrade and expand fish culture production extension services for the purpose of promoting a profitable fresh fish industry in northeast Brazil.

Time Period: 10/66 - 6/74

(Project extended, Inter-American Development Bank Project No. 53 - Currently building fish ponds)

Level of U.S. Funding: \$1,000,000

Summary: The programming goal was to increase the overall production of animal protein from fish through improvement of yields from northeast public reservoirs, improvement of fish production and processing and marketing practices, and introduction of fish culture to farm ponds in the region. Auburn University contracted to provide technical assistance. When purpose is achieved the following conditions should exist: (1) self-sufficiency in planning and carrying out research, development, and extension activities; (2) operating systems of fishery technology, and (3) GOB budget support at level to continue planned operations.

Number of U.S. Personnel: 2 full-time, 1 short-term for 2 months.

Type of Equipment or Knowledge Transferred: Knowledge of fish culture and transfer of laboratory equipment.

Training programs: Three participants trained at MS level in U.S. (DNOCS personnel); 14 short-term participants (working in

Water Resources Project in northeast part of Brazil - drought problems).

- Outputs:
1. Participant training
 2. Three functional laboratory facilities
 3. Increased production of DNOCS fish hatcheries 225% from base of 300,000 in 1965
 4. Fish culture on private farms

Report: Terminal Project Appraisal Report, 1/74 by Mission

Fish variety suitable for propagation in N.E. only developed by 1/73, delayed initiation of extension part of project. Extension program not as advanced as foreseen. Impact of freshwater fish development project greater than expected due to meat shortage in region. Overall success by restructuring technical assistance input. Auburn team critical catalyst in coordinating resources. Commodities purchased, installed, and utilized. Production of DNOCS fish hatcheries increased 225% from base of 300,000 in 1965. Management practices at five largest reservoirs improved. DNOCS providing training for middle-level personnel in reservoir management utilizing U.S.-trained participants.

0513-0277 Chile

Agricultural Cooperative Development Fund

Objectives: To provide financial and technical assistance for rural cooperatives in agriculture, fishing, and related activities. To increase the standard of living for Chilean small farmer and increase agricultural production.

Time Period: 4/75 - 9/80

Level of Funding: \$15,000,000 (loan)

Other Funding: \$7,500,000, IFICOOP and local borrowing; Cooperatives' contributions to project.

Summary: This loan is to Chile's Institute for Financing of Cooperatives (IFICOOP). The project design is to plan, promote, and finance 97 agricultural, artisan, and fishing cooperatives.

The work plan for the fisheries cooperative consists of (1) organization of the cooperative and construction of a wholesale fish terminal; (2) operation by the cooperative of six refrigerated double-trailer rigs to move fish from distant points to Santiago quickly under optimum conditions; (3) operation of a large number of retail fish

stores in Santiago and the provinces on a wholly owned and franchise basis; and (4) operation of a filleting and freezing plant in San Antonio or Talcohuano.

Number of U.S. Personnel: 1 long-term and 4 short-term advisers

Type of Equipment or Knowledge Transferred: fishing boats, fish market terminals (machinery and equipment), trucks and other vehicles for marketing, canning and refrigeration equipment, and market information system.

Recipients: Chilean small farmers who operate farms and fishing ventures: estimated 10,000 fishermen.

Outputs: Approximately 90 subloans (\$19.0 million); technical assistance to IFICOOP and sub-borrower co-ops; installation of office equipment/vehicles for IFICOOP staff (\$140,000).

Report: Joint IFICOOP/AID Project Review, March 1976.

513-0296 Chile

Rural Cooperative Upgrading Grant

Objectives: The objectives of the project are (1) to improve the management capacity and service capability of rural cooperatives, which are primarily composed of low-income farmers or artisan fishermen; and (2) to broaden and strengthen the capacity of the cooperative development bank (IFICOOP) to provide training, technical assistance, and financial support to member rural cooperatives, and the large number of newly organized agricultural cooperatives.

Time Period: 1977-1979

Level of U.S. Funding: \$1,015,829 (grant)

Other Funding: \$320,870 IFICOOP

\$77,573 Cooperatives

Summary: The project will finance three types of training activities for a total of 1,105 cooperative officials from 85 rural cooperatives: (1) participation in formal two-week courses/seminars held at centrally-located training facilities, (2) in-service training (internships) at well-established cooperatives, and (3) on-the-job training at the participating cooperatives. IFICOOP will coordinate the training program through four regional offices, each of which

will be staffed by a regional coordinator and two cooperative specialists.

Number of U.S. Personnel: One long-term adviser for one year and nine months of short-term consultants.

Recipients: The portion of the rural population in Chile belonging to cooperatives.

Training Programs: Training was to be provided to 1,105 officials from 85 rural cooperatives.

Outputs: IFICOOP will establish and staff four regional offices to provide in-country business management training for management and administrative staffs and training in cooperative organization to improve member relations and member participation in the business of the cooperative.

Report: Evaluation, September 1979.

514-T-078 Colombia

Fisheries Research

Objectives: To develop economically and technically sound aquaculture systems suitable primarily, but not exclusively, for small farmer use; and to produce a package of management recommendations appropriate for use by artisan fishermen that is designed to rationalize exploitation and, thus, ensure persistence of the fish population of the lower Magdalena River.

Time Period: 1975-80

Level of U.S. Funding: (loan) \$2,200,000

Other Funding: GOC \$1,082,600

Summary: Loan funds would be used to construct and equip fish culture stations at Repelon on the North Coast, at a site along the Upper Magdalena River, and at a site in the Eastern Plains (the Llanos). These stations will conduct the research necessary to develop aquaculture systems for use primarily, but not exclusively, by small farmers. Loan funds would also be used to construct and equip a station at Magangue on the Lower Magdalena River which would carry out research directed towards identifying a package of improved management practices for use by artisan fishermen in order to rationalize the exploitation of the river.

The loan also contains components that would finance technical assistance in aquaculture, research station management, and lake and river management.

Type of Equipment or Knowledge Transferred: The AID loan supports the research activities and the equipment that are a necessary first step in developing technology packages and river management recommendations.

Recipients: Since the major thrust of the project is the development of economic aquaculture practices, the first group of beneficiaries will be those small farmers who adopt the technological package derived from the research. These farmers should benefit both from improved family nutrition and increased income from sales of fish as they expand the productive capacity of their ponds. As widespread development occurs, consumers will increasingly benefit from the impact of an increased supply of fish from this source.

Training Programs: Long-term academic training, primarily to the masters level, and some special short courses are being financed for personnel from INDERENA and universities working in aquaculture and fisheries management. A number of formal, in-country short courses are also being financed.

Outputs:

1. Physical facilities constructed and equipped at Repelon, Magangue, in the Upper Magdalena area, and in the Llanos.
2. Program of formal short courses designed by INDERENA and training contractor.
3. Personnel trained at M.A. level academic programs in the U.S., in short courses, and in-country training programs.
4. Contracts for research signed by INDERENA with Universities of Caldas, Cordoba, and Valle and with the CVA and INCORA.
5. Technical assistance being provided according to contracts.

Report: Evaluation, June 1979.

522-0124 Honduras

Nutrition

Objectives: To increase the Honduran capability to carry out analysis, planning, and evaluation activities related to nutrition. To improve nutritional status of preschool children and pregnant, lactating women in selected geographic areas.

Time Period: 5/76 - 12/79

Level of U.S. Funding: \$100,000

Summary: The grant/loan project has four components: 1) analysis, planning, and evaluation, 2) nutrition education; 3) water supply and environmental sanitation; and 4) pilot projects intended to provide information regarding several new avenues to improved nutrition for rural families. One pilot project aims at the improvement and expansion of fish farming as a source of food. A \$100,000 loan is for the purpose of expanding the construction of demonstration fishpond breeding stations to serve as training sites and stock sources for those campesino groups that will be participating. Short-term courses in fish culture will be designed for the campesinos. Details and project design to be developed after recommendations made by Auburn technical expert.

527-0144 Peru

Freshwater Fisheries Development

Objectives: To establish a model for increasing inland fisheries production (especially trout) in Peru by demonstrating that intensive fish farm production and sale of trout is profitable and can significantly improve the protein content of the diets of the rural poor.

Time Period: 1977-80

Level of U.S. Funding: (grant) \$465,000

Other Funding: Government of Peru \$386,000

Local Contributions 13,000

Summary: The major elements of the project are

1. The establishment of an experimental, medium capacity trout feed pelleting plant with an ultimate capacity of one metric ton per day. This facility will develop and market the low-cost, balanced feed critical to reducing the feed/meat conversion ratio, and thus the overall profitability of community fish production enterprises.
2. The improvement of the fish hatchery at Huaraz. This hatchery will produce fingerlings and will be the principal instrumentality for introducing genetically improved trout species to community owned and operated fish farms throughout the Department of Anchash.

3. Two community trout fish farms (rearing stations) will be established, one in the Huaylas Valley (Huashao), and the other in the Conchucos Valley (Acopalca). These rearing stations will produce for the commercial markets and will represent an important source of income for the participating communities.
4. Two community-controlled lakes will be stocked, one each in the Huaylas (Catac) and Conchucos Valleys (Acopalca). These trout will be harvested by the communities for local consumption and for regional marketing of the surplus.

Number of U.S. Personnel: Thirty-three weeks for short-term U.S. technical assistance costing approximately \$85,000 will be provided, primarily during the first eighteen months of project activities.

Type of Equipment or Knowledge Transferred: AID inputs will finance required equipment, commodities, and vehicles supporting implementation of planned activities.

Recipients: The poor, rural highland communities of Peru.

Training Programs: Fifty-six man-months of long- and short-term training in the U.S. and third countries will be provided to technicians of the Ministry of Fisheries and the cooperating communities in such areas as fish culture, nutrition, biology, fish processing, and business administration. Promotion of local fish consumption will also be undertaken by the Ministry of Fisheries. (48 months long-term, 2 MS degrees, and 8 months short-term.)

Outputs: There will be six major outputs:

- a) Trout feed pelleting plant: An experimental pelleting plant (1 MT per day) will be established in the coastal city of Chimbote to assure a regular supply of recommended feed rations delivered to subprojects located in Huaraz, Hushao, and Acopalca.
- b) Huaraz hatchery: An existing hatchery in Huaraz will be upgraded through renovations of the brood fish holding area. New sources of eggs and/or fingerlings for genetic improvement will be imported from the United States.
- c) Community Operated Fish Farms (Rearing Stations):
 - (i) Huashao fish farm
 - (ii) Acopalca fish farm
- d) Two Newly Stocked Lakes:
 - (i) Lake Querococha
 - (ii) Lake Purhuay

Report: Project Evaluation Summary, 10/78 by Mission: The project not on schedule. Major problem is lack of coordination and adequate supervision by Peruvian counterpart. Evaluation discusses progress made on each subproject.

Project Status, Quarterly Report, 3/31/80:

- (a) Two fish farms under operation, each one stocked with 100,000 fingerlings.
- (b) EPSEP is commercializing 2 metric tons of fish.
- (c) Yanachocha Lake restocked with 10,000 fingerlings.
- (d) Pellet plant production reached a total of 10 tons (in 1980).
- (e) 900 target community members participated in campaign conducted in December 1979.
- (f) Project is in operating stage. Technical and economic feasibility evaluations required to determine replication possibilities.

532-0038 Jamaica

Inland Fisheries Development

Objectives: To create within the Fisheries Division of the Ministry of Agriculture the institutional capability to design and implement an inland fisheries program involving applied research experimentation and an inland fisheries extension program.

Time Period: 2/77 - 1/79

Level of U.S. Funding: \$355,000

Other Funding: \$622,000

Summary: Technical assistance being provided by an AID contract with Auburn University. The project implemented by the Fisheries Division of the Ministry of Agriculture. Auburn will assist in developing the capability and expertise of the Fisheries Division by providing day-to-day operational guidance and on-the-job training of fisheries personnel. Production aspects of the projects involve extension work and close coordination with the government-sponsored operation project, the Jamaica Industrial Development Corporation and individual farmer/producers. The Fisheries Division to supply the fingerlings, initiate existing pond surveys and extension efforts to small farmer/producers with the assistance of four Peace Corps volunteers.

Number of U.S. Personnel: 1 adviser, short-term consultants, 4 Peace Corps volunteers.

Number of Foreign Personnel: 4 professionals, 10 nonprofessionals

Type of Equipment and Knowledge Transferred: Commodities to equip a fisheries research laboratory; six vehicles to maintain an extension program and distribute fingerlings and supplies to production ponds.

Recipients: 260 small farmers and their families (1,560 persons) plus indirect beneficiaries (approximately 1,560).

Training Program: 3 individuals trained at graduate level in a technical aspect of aquaculture production in U.S., 12 man-months equivalent of short-term training or observation.

Outputs: 1) An improved management applied research and extension capability within the Fisheries Division; 2) an efficient and improved Twickenham Park Fisheries Station; 3) an increase in fish yields up to 3,000 pounds per acre annually for small producers and up to 10,000 pounds per acre annually at Mitchell Town; and 4) establishment of an accurate records unit within the Fisheries Division.

Report: Evaluation, 4/79 from Mission:

Short-term training goals have been exceeded. Long-term training goals may not be met, which could delay expansion of project (one did not return). Project has achieved its purpose to create within the Ministry of AGR the capability to support a fresh water fisheries program. Facilities are operational. Survey of ponds completed and extension program operational. Small farmers and consumers have benefited. Provisions for second long-term adviser. Formal course in aquaculture introduced at Jamaica School of Agriculture, taught by project personnel providing in-country training in management and production.

532-0059 Jamaica

Fish Production System Development

Objectives: To develop the capacity of Government of Jamaica institutions to increase freshwater fish production throughout the country, primarily through assistance to small farmers.

Time Period: 7/79 - 7/83

Level of U.S. Funding: AID \$1,367,000 Grant
 \$2,740,000 Loan
 Peace Corps \$420,000

Other Funding: Government of Jamaica \$4,858,000

Summary: The project will build upon the accomplishments of the AID funded Inland Fisheries Development Project (532-0038), which established a knowledge base for conducting freshwater fish production activities in Jamaica and developed institutional capabilities for the production of fingerlings and the extension of fish farming techniques to farmers. The project will be supported by the U.S. Peace Corps, which will provide volunteers to help train fisheries extension officers and facilitate a more rapid expansion of the program during the take-off phase.

Number of U.S. Personnel: 3 long-term AID advisers
 10 person-months short-term AID advisers
 25 Peace Corps volunteers

Number of Foreign Personnel: 36 professionals
 124 nonprofessionals

Type of Equipment or Knowledge Transferred: Commodities to operate fisheries; research and training facilities and two hatcheries; feed, fertilizer, and seine material for participating farmers; 3 station wagons; 20 pickups; 2 vans; 4 trucks; 3 bulldozers; 3 tractors; 20 trail bikes.

Exchange of Personnel: While Jamaican School of Agriculture personnel are in training in the U.S., their teaching obligations at JSA will be met by long-term technical advisers and by Inland Fisheries Unit personnel.

Recipients: 1,280 farmers, including 1,020 small farmers (average farm of five acres); 74 percent of larger farms will be cooperatives or government farms comprising small and/or landless rural inhabitants; 750 urban and rural dwellers who will be employed in processing, packaging, and marketing of fish.

Training Programs: In-service training for 27 new hatchery and extension staff members, 12 months of U.S.-based aquaculture training for a researcher/training officer; 14 months U.S.-based aquaculture extension training for two regional extension specialists; 24 months U.S.-based aquaculture training for a regional production/extension officer; 12 fishery extension agents will be sent on a rotational basis to a 15-week special Aquaculture Training Program for foreign biologists at Auburn. One-week short courses will be given

to participating farmers; 15 months training for two Jamaica School of Agriculture staff members who will teach a three course curriculum (Introduction to Fish Culture; Pond Management; Aquaculture Extension Methods); nine months postdoctoral training for one faculty member of the University of the West Indies.

Outputs: The major outputs of the project will include the establishment of a fish hatchery/demonstrational facility with 20 acres of ponds at Ferris Cross; the expansion of the research ponds at Twickerham Park to 10 acres; annual production of 13 million fingerlings; the strengthening and expansion of the Inland Fisheries United (IFU) with 116 new full-time personnel, 24 of whom will be at the professional level and will have received formal and practical training in fish production; the establishment of in-country and Caribbean regional fish production training programs to provide the following:

- a. training of 920 farmers in fish farming through the IFU, Ministry of Agriculture (MOA);
- b. training of up to 90 extension agents, fish farm managers, and professional fisheries personnel from Jamaica and the greater Caribbean area through IFU-sponsored (annual) regional workshops, conducted with technical assistance;
- c. training of 45 students in fish culture at the Jamaica School of Agriculture to prepare for careers with the IFU or the MOA extension service, large-scale GOJ or private sector fish farms, and other regional Caribbean countries;
- d. training of up to 20 students in aquaculture at the University of the West Indies for careers at the research, educational, administrative levels, in Jamaica or other regional Caribbean countries;
- e. establishment of a country-wide fisheries extension program with 1,280 farmers participating, with 110 surface acres of water in production and 6 million pounds of fish produced annually by 1983.

Report: First evaluation scheduled approximately 7/80.

603-0002 Djibouti

Small-Scale Fisheries Development in Djibouti

Objectives: To assist small-scale fishermen in increasing fish catches and to encourage increased in-country consumption of fish. To improve and increase the production and marketing of fish, thus increasing employment, improving the diet, and reducing food imports.

Time Period: 1979-81

Level of U.S. Funding: \$750,000

Other Funding: FAO - \$400,000; France-\$400,000

Summary: To increase production beyond the present 500 tons a year, the Government of Djibouti in cooperation with FAO, France, and USAID is seeking to introduce a number of technical and organizational improvements. AID will furnish technical assistance, an ice machine, vehicles, improved gear, and training in support of this project. The FAO will supply the services of a master fisherman and a boat at a total value of \$400,000. The French will furnish two ice machines, assistance with fishing cooperatives, and an adviser, at a total value of \$400,000. The FY 80 program calls for an AID contract fishery adviser in coordination with FAO to help establish a credit system for fishermen, advise on the construction and operation of ice plants, develop a transport and marketing network, advise on possibilities of fish processing, and train local staff for all aspects of the project.

Type of Equipment or Knowledge Transferred: Fishing equipment, 10 outboard motors, 1 flake ice machine, 1 generator, 2 trucks, 12 insulated boxes, 2 reefer boxes, 200 plastic fish boxes, 1 pickup truck.

Recipients: Direct beneficiaries will be some 300 families of commercial fishermen plus 100 families involved in the marketing process. Indirectly the whole economy will benefit from the increased income and economic activity as well as the increased quantity of fish protein.

Outputs:

- 1) Equipment procured
- 2) Ice plant established
- 3) 2 rural distribution centers established
- 4) 300 persons engaged in fishing

615-0130 Kenya

Fisheries Development

Objectives: To assist the Government of Kenya (GOK) in improved fishing methods, and marketing in the Lake Victoria area in order to ensure a reliable supply of protein supplement for the people of Kenya.

Time Period: 4/65-3/70

Level of U.S. Funding: \$222,000

Other Funding: GOK - \$302,000

Summary: Specific goals of the project are 1) to investigate new techniques of fishing with improved gear; 2) to locate new fishing sites; 3) increase the catch of fish from Lake Victoria from 11,600 tons in 1963 to 20,000 tons in 1970; 4) introduce the use of motor-driven boats and train 500 fishermen in the use of improved fishing boats and gear; 5) to improve the organization of fish marketing so as to facilitate and increase distribution and reduce market losses and; 6) to assist in the formation of fishermen's cooperatives.

Number of U.S. Personnel: shellfish biologist, 6 months; lake fisheries adviser

Type of equipment or Knowledge Transferred: USAID introduced monofilament nets in experimental fishing.
Commodities-seines, boats and winch.

Recipients: Kenya's rural population

Training Programs: Two degree-level participants in United States, 500 fishermen trained in basic fishing techniques, and the use and maintenance of improved gear.

Outputs: 1) increase in fish catch to 20,000 tons from 11,000 tons; 2) procure & install flake ice machine; 3) participant training for 2 fisheries officers; 4) construct fisheries substation at Port Victoria

618-0649-02 East Africa

Freshwater Fisheries

Objectives: Improve the capability of East African Freshwater Fisheries Research Organization (EAFFRO) to conduct fish stock research on continuing and independent basis and to increase the supply of fish protein for population of East Africa.

Time Period: 10/69 - 9/80

Level of U.S. Funding: \$2,392,000

Summary: EAFFRO research provides an information data base permitting member staes (Kenya, Tanzania, and Uganda) to regulate lake and river fisheries for maximum catch and to inform fishermen where and how to fish most efficiently.

Number of U.S. personnel: 4 fisheries biologists, 1 fisheries researcher statistician

Type of Equipment or Knowledge Transferred: AID providing research field equipment and reference books and journals.

Recipients: Primary beneficiaries are EAFFRO and its personnel

Training Programs: Train two East African biologists, 5 participants in U.S. for graduate education

Outputs: 1) expand fish tagging program to Tanzania and tag a total of 50,000 fish on Lake Victoria by 9/77; 2) make recommendations on the practicality of light inboard trawlers for inshore fishing in Kenyan & Tanzanian waters by 9/77; 3) submit recommendation for the gradual mechanization of the inshore canoe fishing industry by 9/77; 4) establish data bank on fish catch records; 5) design and initiate a research program to monitor the expanding mechanized fishery on Lake Victoria; 6) complete an economic study on the trawling costs and earnings and the market impact and its effect on traditional fishermen's earnings; 7) initiate biological studies on common species of Haplochromis and make recommendations on their harvesting; 8) complete training of five EAFFRO scientists to replace U.S. technicians.

620-0212 Nigeria

Agricultural Planning and Advisory Services

Objectives: To improve the processing capability of Ijora fisheries terminal and to assist the government of Nigeria in the installation of fish processing equipment and leasing of completed facilities to the private sector.

Time Period: 1960-74

Level of U.S. Funding: \$4,271,405

Summary: The project agreement provided for the employment of two experts to assist the Government of Nigeria. The specialists were to supervise Nigerian fisheries personnel in the reconstruction of equipment, and the training of staff and were to ensure satisfactory operation of the plant. Project

provides for continuing planning advisory and supervisory services of Food & Agriculture Division of AID in coordinating and directing all projects and activities. The staff works closely on food and agriculture matters with appropriate officials of Nigerian federal and state governments and reviews host-country plans, programs and requests assistance, sets policy directives applicable to the mission's agricultural program, and maintains liaison with AID/Washington.

Project Contracts: 1) potato production specialist; 2) fisheries/refrigeration specialist to supervise Nigerian fisheries personnel in rehabilitation of damaged refrigeration equipment, assembly of machinery, training of staff, and assurance of satisfactory operation of Ijora fisheries terminal.

Number of U.S. Personnel: 8 USAID technicians

Type of Equipment or Knowledge Transferred: Commodities, books, technical journals, periodicals, reports, charts, survey maps, and other publications.

Training Programs: 6 participants trained in U.S.; 1 in Philippines

Report: Initial Audit Report, Area Auditor General African (west) Dec. 1971.

620-0704 Nigeria

Fisheries Development

Objectives: To increase production and consumption of fish by an average of 100 percent annually over 10 years in order to 1) develop a rich natural resource; 2) provide a protein-rich food for the Nigerian diet; 3) reduce foreign exchange draining imports of fish; 4) develop the export potential of shrimp and shark hides and fins; and 5) provide and opportunity for the development of potentially profitable business that will increase the incomes and standard of living of a large number of the Nigerian people.

Goals: 1) increase production of fish by providing training to fishermen and improved fishing technology (modern boats and gear) 2) improve distribution marketing and processing methods so as to expand inland market areas.

Time Period: 5/62 - 6/68

Level of U.S. Funding: \$561,000

Summary: Specific goals of the project consist of 1) developing the Western Nigerian Cooperative Fishermen's Association into a viable business organization to expand fisheries potential; 2) the initiation of a production phase of operation including the building of trawlers locally for co-op members; 3) the initiation of a marketing and processing phase; and 4) the development of the shrimp fisheries with emphasis on foreign markets.

Number of U.S. Personnel: 3 technicians--1 freshwater fisherman, 1 fishing gear technician, 1 marine engineer. Technical assistance-- 1 marketing advisor, 1 gear and equipment specialist, 1 cooperative specialist, 1 TDY ship builder, 1 principal fisheries officer.

Number of Foreign Personnel: 9

Type of Equipment or Knowledge Transferred: Oceanographic survey equipment, 2 refrigerated trucks, 9 canoes, 35 outboard and 6 inboard motors, 3 vehicles, 15 refrigerators, ice-making machines, nets and gear, shop tools, fish boxes, fish processing and handling equipment.

Training Programs: To train 200 officials and members of the fisheries cooperative in improved fishing methods. On-the-job training in equipment maintenance, boat construction, and design. Two participants trained.

Outputs: 1) conduct experiments and research for program development for pond fisheries; 2) train 200 fisheries cooperative officials and members in the use of improved boats and auxiliary gear, and train 2,000 cooperative members in better fishing methods and gear fabrication; 3) improve fish marketing organizations with emphasis on cooperative marketing at Warri, Sapal, Benin, Ibadan, and the Lagos area, to reduce spoilage and marketing losses by 25 percent in 1967; 4) increase production and consumption of fish by an average of 100 percent annually over next ten years.

Report: End of Tour Report, Charles L. Kaufman, December 1964
Memo by Russell O. Olson, AGR, to William R. Ford, April 30, 1973--Project made satisfactory progress until civil war in 1967. Project terminated 1968. Work on Ijora terminal completed in 1970 and in 1971 USAID provided an additional 5 man-months of assistance for final assembly and installation of equipment.

Final Audit Report, November 24, 1972, West African Auditor General--AID Progress satisfactory until civil war. At that time, Western State reduced its financial support. Delayed completion of the renovation at key facility in the project

plan, the Ijora Fisheries terminal. Commodities earmarked for installation were installed on a temporary basis or stored under adverse conditions. Ultimate deterioration of terminal precludes the use of it to unload fish; marketing and processing activities ceased. Mission terminated project in FY68.

Achievements:

- 1) 35 outboard engines and sea canoes were provided to stimulate mechanization. Over 400 local fishermen are now using outboard engines.
- 2) demonstrational fish ponds - 3 ponds in operation.
- 3) inland fishery - 300 private or community fish farms operating in Western State compared to 139 operating in 1969.
- 4) Participants - since 1965, two participants sent to United States, one for 6 months in cooperative management; one for 2 years for masters degree in fisheries.

631-0022 Cameroon

Small Farmer Fish Production

Objectives: To improve the diet, diversify farm production, and augment the income of the rural population of Cameroon. To increase the amount of fish produced and consumed in the rural sector and to strengthen and expand the existing infrastructure responsible for the fish culture program.

Time Period: 1980-82

Level of U.S. Funding: \$1,325,000 (AID \$450,000; Peace Corps \$875,000)

Other Funding: \$1,153,000-Camaroon

Summary: The project is designed to encourage the renovation of abandoned fish ponds and establish new ponds. The two parts of the project are a) the operation of fish stations capable of supplying fingerlings to the farmers and b) the provisional extension services that instruct the farmer in the proper methods of fish culture.

Number of U.S. Personnel: 1 technician for 1 year; 30 Peace Corps for volunteers, 3 years.

Type of Equipment or Knowledge Transferred: AID to finance transportation vehicles (pickup truck and motorcycles) as well as funds to maintain and operate the vehicles; and purchases for materials and supplies to improve both farmer and monitoring training, and hand tools.

Recipients: 12,000 families who will operate private fish ponds.

Training programs: Training seminars for farmers will be presented in villages currently unserved. Eight National Fund for Forestry and Fish Culture (FNFP) personnel were sent by AID to Auburn to participate in a 22-week program in warm-water fish culture.

Outputs: 1) Improved mid-level management of the FNFP's fish culture program; 2) Improved training of the FNFP's fisheries monitors; 3) improved and expanded extension services offered by the FNFP; 4) increased number of rural farmers participating in fish culture; 5) increased quality of fish culture as it is practiced in the rural sector; 6) increased total number of fish produced and consumed in the rural sector.

641-023 Ghana

Volta Lake Technical Assistance Project

Objectives: To develop effective aquatic weed control methods for Lake Volta and to assist in preparing specific programs for the general development of the lake's fishing industry.

Time Period: 10/68-10/71

Level of U.S. Funding: \$60,000

Other Funding: Ghana \$15,000; Other donor - \$236,000

Summary: In 1968, the Government of Ghana signed an agreement with the UNDP and UN/FAO for developing Lake Volta. The USAID adviser to assist in developing the fishing industry on the lake.

Number of U.S. Personnel: 1

Type of Equipment or Knowledge Transferred: A small aluminum boat, and demonstration supplies.

Exchange of Personnel: USAID adviser, and Volta River Authority counterpart for aquatic weed control.

Training Programs: One individual was sent to U.S. for 6-months training program in advanced aquatic weed control procedures.

Outputs: Aquatic Weed Control

- 1) Based on surveys and control tests complete aquatic maps for Lake Volta showing distribution of potential problem species and their annual rate of expansion by June FY 71.
- 2) One VRA (Volta River Authority) senior employee trained administering and extensive aquatic weed control program by June FY 71.
- 3) Nine VRA trainees in aquatic weed control techniques and procedures by June FY 70.
- 4) Three complete training in aquatic weed control techniques and procedures by June FY 70.
- 5) Final report to VRA outlining aquatic weed control recommendations and procedures developed during the project by FY 71.

Fisheries Development

- 1) Final report of results of field experiments conducted during 1968-69 comparing monofilament and multifilament gill-nets and recommendations for increasing the Lake fishermen's catch by Dec. FY 70.
- 2) Intermediate report of results of field experiments commencing in April 1969.
- 3) Final report of results of field experiments commencing in April 1969 together with any applicable recommendations by FY 71.

649-0006 Somali Republic

Fisheries

Objectives: To modernize the Somali fishing industry.

Time Period: 6/57-6/66

Level of U.S. Funding: \$389,000

Number of U.S. Personnel: One adviser

Type of Equipment or Knowledge Transferred: Demonstration fishing gear, and construction of fishing boats.

Report: End of tour reports, William Napier, 9/13/60 and period of October 10, 1960, through October 30, 1962.

657-0006 Guinea-Bissau

Development of Small-Scale Fisheries Sector: Guinea-Bissau

Objectives: To assist the Government of Guinea-Bissau in upgrading nutritional standards in the country through development of the small-scale fisheries sector, with particular emphasis on increasing the amount and quality of fish available and distributing it more widely among the population. Particular objectives are 1) to promote development of a pilot project for the small-scale fisheries sector, based on one fishing port and serving the population of one region and 2) to promote the development of a Fisheries Management Unit within the Fisheries Secretariat of the Government of Guinea-Bissau.

Time Period: 1979-82

Level of U.S. Funding: \$500,000

Other Funding: \$20,000 Government of Guinea-Bissau

Summary: Proposed activities consist of technical assistance and training along with providing basic materials necessary to promote the development of a pilot program to increase the supply and distribution of fish from an artisanal source. In the FY 1980 program plan a system for providing credit for fishermen will be established and a marketing network will be made operational. An inventory list for the fishermen's store will be developed and a counterpart trained to manage the store and handle the sales and credit operation.

Number of U.S. Personnel: 1

Number of Foreign Personnel: 2

Type of Equipment or Knowledge Transferred: Boats, fuel, materials for construction of fishing gear and associated needs, and credit facilities. Short-term technical assistance experts in sociology, food technology, store management consulting, credit consulting, and mechanic training.

Recipients: Project will benefit directly 200 fishermen in the Casheu region through training, marketing assistance, and access to fishing supplies. Indirectly, the project will benefit about 158,000 people in five areas who will have access to an increased supply of fish. Also, personnel to be employed and trained at the local and national levels will benefit.

Training programs: In-country training concentrating on the development of competency in performing appropriate activities.

- Outputs: 1) To promote development of small-scale fisheries at the port of Casheu.
 2) To promote development of a Fisheries Management Unit within the Fisheries Secretariat of the Government of Guinea-Bissau.

660-056 Zaire

Fishing Cooperative Expansion

Objectives: To assist the government and a local fishing cooperative (COPELAZ) to improve the cooperative's capabilities, in fish production, processing, and marketing and increase the consumption of fish protein in the Uvira and Fizi zones of the South Kivu region near Lake Tanganyika.

Time Period: 1976-80

Level of U.S. Funding: \$400,000

Other Funding: Govt. Zaire \$170,000 - COPELAZ \$28,000

Summary: The project's significance is related to the government's increasing emphasis on food production as a key development priority and the need to respond to the high incidence of malnutrition in rural Zaire. AID will assist in training and strengthening COPELAZ management through a demonstration project and by providing essential commodities to facilitate processing and marketing. AID to provide three technicians to conduct a comprehensive technical and economic feasibility study of the project.

Number of U.S. Personnel: 2 Peace Corps specialists, 3 technicians (short-term)

Type of Equipment or Knowledge Transferred: Trucks, nets, lamps, boats, and outboard motors.

Recipients: Traditional fishermen in Uvira and the local population of the Rvizizi Plains will benefit. The members of the cooperative should benefit by increasing their income by gaining access to more modern fishing and receiving important operating services.

Outputs: Doubled fish catch within two years and improve fish processing and marketing. Modernized artisanal fishing fleet; Cooperative marketing system (9 selling stations; 22 drying stations; 3 storage depots); Cooperative services for fishermen (mechanic repair shop, fishing gear store).

660-0080 Zaire

Fish Culture Expansion

Objectives: To assist small farmers in producing fish and to rebuild abandoned fish ponds and hatcheries.

Time Period: 1978-79

Level of U.S. Funding: \$10,000,000 loan

Summary: AID strategy is to support Zairian development efforts and priorities while assisting in maintaining economic and political stability necessary for development. Activities primarily directed toward areas of food production, nutrition, health, and population. Project approved to provide technical and institutional support to fishing cooperatives in an effort to increase fish protein consumption.

669-003 Liberia

Freshwater Fisheries

Objectives: To establish and develop a scientifically sound program of research and extension activities in freshwater fisheries with emphasis on the establishment of farm fish ponds and the development of methods and means of increasing the harvest of fish from rivers and small streams in the interior, thereby increasing the output and consumption of animal protein in the interior areas.

Time Period: 7/61-6/67

Level of U.S. Funding: \$328,000

Summary: The fisheries program includes 1) fingerling propagation and experimentation at the Central Agricultural Experiment Station at Suakoke under the administration of the Agricultural Research Organization; and 2) fish pond construction and management carried out in the interior under the administration of the Agricultural Extension Service.

Number of U.S. Personnel: 2

Number of Foreign Personnel: 7

Training Programs: One Liberian obtained MS degree in United States; three Liberians obtained BS degree from local college; On-the-job training for the three college graduates and three high school graduates.

Outputs: 1) To establish at the Central Agricultural Experiment Station, Suakoko, by the end of 1964; a) a well-equipped laboratory with adequate water and electrical systems for laboratory research; b) 92 experimental and hatchery ponds including 12 production, 20 brood, 20 rearing, 20 feeding, and 20 holding ponds for the study of fish species, nutritional and various other phases of freshwater fish culture, and for the rearing and distribution of fingerling fish to farmers; c) design and construct a fish transportation unit to increase the efficiency of the handling and distribution of adult and fingerling fishes. 2) Establish in the Western Province a hatchery by July 1963. 3) Offer technical guidance which will lead to the construction of 600 privately owned ponds in extension areas by the end of 1968. (25 in FY 61, 50 in FY 62, and 75-100 per year through FY 68) 4) Assist one Liberian in acquiring an MS degree in zoology and fisheries management in U.S. by end of 1962 and assist three Liberians in obtaining local college BS degrees, and train the college students on the job as well as three high school graduates by end of 1964.

Report: End of tour report, William A. Smith, Jr. 8/60-12/62.
 End of tour report, William A. Smith, 5/63-7/64.
 End of tour report, Charles B. Wade, 3/63-1/65.

685-0240 Senegal

Lowland and Fish Culture Project

Objectives: To introduce fish culture to Senegal River Valley by establishing small farmer extension program. To augment production and availability of highly nutritious food as well as increase income of rural farmers of the Fleuve Region of Senegal.

Level of U.S. Funding: \$389,000 (AID - \$161,000; Peace Corps \$214,000; Public Law 480 - \$14,000)

Other Funding: \$60,000 Senegal

Summary: Two-year project for which AID financial and technical assistance is needed to 1) construct and manage a fish culture station for fingerling production, training, research, and food production; 2) train and support Eaux et Forets fish culture extension agents; 3) support Peace Corps fish culture technicians. It is assumed that the Peace Corps will play an active role in the project's development and management and provide the required number of volunteers. AID will finance the construction of an office building/

laboratory and a warehouse for storage of equipment. The government of Senegal will fund personnel salaries and indemnities for seven fisheries agents and the project director. The Peace Corps will fund living allowances and support costs for the seven volunteers and will contract with an ex-fisheries volunteer for 9 months.

Number of U.S. Personnel: 7 volunteers

Number of Foreign Personnel: 7 counterparts, 1 driver, 3 laborers

Type of Equipment or Knowledge Transferred: 14 motorcycles and a land rover vehicle, parts, fuel, and oil. Equipment--nets, small tools, manuals, medicines, and laboratory equipment. Construction equipment--pipes and outlets, station equipment, tools, building.

Recipients: The primary beneficiaries will be the rural farmers and their families who will have more protein-rich food and a higher cash income.

Training Programs: Train Senegalese counterparts at station.

Outputs: 1) 6 Eaux et Forets agents trained and operating; 2) Senegalese Fish Station Director; 3) Fish station constructed and operating; 4) 90-180 participating farmers; 5) total fish production increased in FY 80 to 12.5 tons and in FY 81 to 35.5 tons; 6) value of production increased.

695-0102 Burundi

Highland Fisheries Development

Objectives: To increase incomes and to improve the nutritional status of the rural poor. To assist the government of Burundi in the development of fish resources in the highland provinces.

Time Period: 1979-81

Level of U.S. Funding: \$540,000

Other Funding: \$44,000

Summary: Based on a report submitted to AID by an Auburn University team in July 1978, AID revised their previous large-scale plans for a Burundi Highland fisheries project. The Auburn team recommended a two-year, two-person technical assistance project to determine the feasibility and appropriateness of a long-term large-scale project. An

aquaculturist will work with the government in training personnel of the Fisheries Service and in developing a program to test fish training potential at the Karuzi Fish Farm. A fisheries biologist will work with the Fisheries Service to distribute nets and to develop and implement a plan to monitor and regulate the lake fishery.

Number of U.S. Personnel: 2

Type of Equipment or Knowledge Transferred: Support for the Karuzi Fish Farm and lake fisheries (nets, one boat); also 2 campers and 2 trail bikes.

Training Programs: Training of fisheries service personnel

Outputs: An assessment of the technical, biological, economic, social, and administrative feasibility of fish culture.

696-0112 Rwanda

Fish Culture

Objectives: An increase in the availability of nutritious food and the incomes of farm families. To develop the capacity of Rwandan farmers to build and maintain productive on-farm fish ponds.

Time Period: 1980-82

Level of U.S. Funding: \$2,000,000 (AID \$1,450,000 - Peace Corps \$550,000)

Other Funding: \$670,000

Summary: Five-year project at the end of which the following conditions are expected to be achieved: 1) an estimated 1200 fish ponds, producing approximately 36 tons of fish on 600 farms in Rwanda's ten prefectures and 2) a national extension program established to support the development of on-farm fish production in Rwanda's ten prefectures.

Number of U.S. Personnel: 12 Peace Corps volunteers for 5 years. Fish Culture specialists (5 person-years) short-term consultants (30 person-months)

Number of Foreign Personnel: 10-15 extension workers, 12 counterparts, 120 agriculture extension agents.

Type of Equipment or Knowledge Transferred: Vehicles - 24 motorcycles, 2 Toyota pickups, operation and maintenance costs. Materials & equipment - nets water analysis equipment, scales, fertilizers, feeds, lime, cement, tools.

Recipients: The prime beneficiaries will be the farmers and the farm families throughout Rwanda who have a) access to land on which fish ponds can be constructed and b) access to information and technical support provided by Peace Corps.

Training Programs: Ministry of Agriculture (MOA) extension workers trained in fish culture.
In-service training programs in fish culture provided to MOA agricultural extension agents.

Outputs: 1) 600 farmers trained in fish culture; 2) 10 national fish stations improved or constructed; 3) a demonstration pond in each commune; 4) an estimated 30 MOA extension workers trained on-the-job in fish culture; and 5) an estimated minimum of 120 agricultural extension agents trained in principles of fish culture.

698-0620 Africa Regional

The Guinean Trawling Survey

Objectives: To investigate the demersal fish potential of the west African continental shelf from Cape Koxo to the mouth of the Congo River in relation to environmental conditions.

Time Period: 6/62-6/66

Level of U.S. Funding: \$727,520

Other Funding: \$279,860 in the form of cash, services of scientists, equipment and facilities provided by the United Kingdom, France, Belgium, Netherlands, Federal Republic of Germany, USA, FAO, UNESCO, OUA/STRC (CCTA), and West African nations from Senegal to the Congo.

Summary: The USAID contract was made to the Commission for Technical Cooperation in Africa, which on 1 January 1965 became the Scientific, Technical and Research Commission of the Organization of African Unity (OAU/STRC). The Director of the Guinean Trawling Survey was Dr. Francis Williams. It was based on OAU/STRC headquarters in Lagos, Nigeria.

Number of Foreign Personnel: 1 permanent (Director). Other scientific personnel, including USA, were on temporary assignments and numbered 29.

Exchange of Personnel: See above

Recipients: OAU/STRC and member countries

Reports:

F. Williams, 1968

Report on the Guinean Trawling Survey

Volume I General Report, viii & 828 p., Fig. 22, pl. 2

Volume II Environmental Charts, fig. 238

Volume III Data Report (ed. NODC, Washington, D.C.)

vii & 551 p., fig. 1, pl. 1

Organization of African Unity; Scientific, Technical and Research Commission; Lagos, Nigeria, 1968, Publication No. 99.

F. Williams, 1968

Review of the Principal Results of the Guinean Trawling Survey. U.S. Fish Wildl. Serv. For. Fish. Leaflet. (1950).

Also published in Proc. Sympos. Oceanogr. Fish. Resources from Atlantic Review Papers and Contributions. UNESCO, 1969: pp. 139-146.

730-0317 Vietnam

Fisheries

Time Period: 3/67-12/70

Level of U.S. Funding: \$280,000

931-0042 Brazil

Fisheries Training Center

Objectives: To develop aquaculture technology to permit the commercialization of freshwater fish culture and to increase the availability of animal protein for the people of northeast Brazil.

Time Period: 7/74-2/79

Level of U.S. Funding: \$290,000

Summary: This project is a continuation of project 512-2474, Fish Production Processing and Marketing funded by the Brazil mission. Contracts with Auburn University have made possible continuing assistance in Brazil since 1969 with one or two fishery experts. Early work was oriented toward stocking reservoirs and managing fishing from these reservoirs. This work continues to be an important function of the Pentecoste Station and related hatchery and fishery management practices

are part of the course work offered. Emphasis of the station has shifted to research in aquaculture. Training courses in fish culture techniques and on-the-job training planned and conducted by Auburn in Brazil. Training emphasized demonstration for secondary-level technicians and fish pond owners and operators. During the process of fish pond development for training, assistance was provided in marketing, preservation, and processing systems. Desirable species for particular types of ponds were selected and extension programs to acquaint private pond owners with fish culture techniques.

Number of U.S. Personnel: 1 or 2

Number of Foreign Personnel: 16

Training Programs: Pentecoste Center has assumed an international training function. Offers an annual 6- to 8-week practical training course. 145 biologists trained.

Outputs:

1. 145 Biologists trained at Pentecoste Center
2. Domestication of Selected Amazon Fish Species--three species have been reared and spawned in captivity
3. Production of Monosex Hybrid Tilapia
4. Develop fish production systems to utilize livestock manure
5. Develop uses for specific agricultural waste products available locally
6. Strengthen International training capabilities of the Pentecoste Center staff

Report: Progress reports published by Auburn University available. Project Evaluation Summary, 1/78-3/78, Richard A. Neal; DS/AGR/F

931-0113

Institution Development Grant 211(d) (AID/csd-2455),
International Center for Marine Resource Development (ICMRD),
University of Rhode Island

Objectives:

May 1969 original grant:

1. Conduct a series of multidisciplinary studies dealing with the role of marine resources, particularly fisheries, in developing countries.
2. Organize courses of study and seminars, interdisciplinary where desirable, in degree programs

related to marine resources and their role in the food and nutrition needs and development programs of developing countries.

3. Increase the capacity of the University of Rhode Island to provide administrators and researchers in developing countries with advanced, general, and specialized education in various aspects of marine resource utilization.
4. Provide training and educational opportunities for professional staff members of AID, BCF, and other interested public and private agencies through short courses, symposia, and university course work.
5. Provide for the university's involvement in technical consultation and assistance and research on marine matters in developing countries for AID and agencies with similar interests.

September 1975 Supplemental Grant:

1. Continue to develop and extend the knowledge base and research capability within the redefined focus of small-scale fisheries development.
2. Develop a more effective advisory response capability.
3. Develop a specialized education and training capability.
4. Develop and maintain an information service.

September 1976 Supplemental Grant:

1. Continue to develop and expand the knowledge base and their own research output.
2. Mobilize manpower resources to provide technical assistance in resolving fisheries sector problems in developing countries.
3. Maintain and operate an up-to-date information service.
4. Strengthen linkages to other fisheries development institutions in developing countries.

Time Period: 5/69-12/79

Level of U.S. Funding: \$2,010,000

Summary: The original 211(d) grant was awarded to the University of Rhode Island (URI) for a five-year period for a total of \$750,000. The university established the International Center for Marine Resource Development (ICMRD). After evaluation, the grant was extended and additional funding was provided as follows:

1. May 1974 - Team Review
2. June 1974 - \$175,000 added to extend project to August 1974
3. September 1975 - \$450,000 added to extend project to August 1977

4. July 1976 - Team Review
5. September 1977 - \$635,000 added to extend project to August 1979
6. November 1978 - Interim Regular Review
7. August 1979 - Project extended (with no additional funds added) to December 31, 1979

Major modifications were made in the objectives and direction of the project following the May 1974 review and after the July 1976 review as can be seen in the Objectives section above.

Section 211(d) of the Foreign Assistance Act of 1961 provides for funds for support of "research and educational institutions in the U.S. for the purpose of strengthening their capacities to develop and to carry out programs concerned with economic and social development of less developed countries." ICMRD was established by URI to strengthen its research, training, consultation, and service capacities in marine resources, especially fisheries, and to expand current on-going university marine resource capabilities to man international dimension.

Abstract of Grant Language:

"The Center will allow the University to direct to the problems of less developed nations its existing, planned, and proposed integrated strength in development economics, marine resource economics, marine biology, oceanography, ocean engineering, fisherman training, fishing gear research, food technology, marine resource extension work and supporting social science interest exemplified by the Law of the Sea Institute administered by the University.

"Funds...will be used to engage present faculty to enlarge on their interests in international studies, to hire new faculty with these interests, to support domestic and foreign graduate and special students while they pursue their education or training in programs relevant to the purposes of this grant, to improve library holdings, to help finance visiting lecturers for seminars, courses, and symposia and to provide for necessary supplies and travel related to this program.

"The result will be an integrated multi-discipline Center with capabilities for identification of and consultation on the solution of economic, biological, technical, social, and institutional problems and constraints and the development and attainment of opportunities related to the role of marine resources in less developed countries. The work of the Center will be coordinated and integrated with and supported by the existing and expanding University activities in these subject areas on the state and national level."

Training Programs: see annual reports

Outputs: see annual reports

Report: Annual Reports of the International Center for Marine Resource Development for 1969-70 thru 1977-78.

931-0120

Auburn University, International Center for Aquaculture
Institutional 211(d) Grant (AID/csd-2780)

Objectives: To strengthen specialized competency in aquaculture of the International Center for Aquaculture and to expand its capability in international development activities in inland fisheries and aquaculture.

Major objectives (initial grant period, 6/70 - 7/75):

1. To add experts in selected fields to the faculty;
2. To develop a library of worldwide literature on aquaculture and more effective methods for dissemination of this information;
3. To provide educational opportunities in aquaculture for personnel of AID and other governmental and private foundations, for students and for foreign country participants; and
4. To develop a worldwide collection of data on food fishes and other aquatic organisms that appear suitable for culture.

Major objectives (2-year extension period 6/75-6/77):

1. To provide educational and training opportunities in inland fisheries and aquaculture related to international development;
2. To continue to develop and improve the knowledge base of Auburn University, including the development of a capability in production economics as related to aquaculture;
3. To develop a more effective capability for advisory services and actively promote its utilization;
4. To continue to collect, analyze, publish, and disseminate information;
5. To develop a strong professional network of linkages between Auburn and LDC institutions, international development agencies, and U.S. institutions.

Time Period: 6/70 - 4/78

Level of U.S. Funding: \$1,618,000

Summary: The original 211(d) grant (AID/csd-2780) was awarded on April 30, 1970, for five years. In June 1975 the grant was extended for another six months and finally in December 1977 it was extended through April 1978.

The purposes of the most recent extensions were to provide core support for the maintenance and further development of Auburn's capability to promote utilization of aquaculture and to further the development of that capability in the war on poverty and hunger in the LDC's. In addition, funds were to: 1) broaden the discipline base as applied to aquaculture; 2) maintain a concentration on warmwater aquaculture and inland fisheries but with a total systems competence within this focus; 3) expand response capabilities in planning at both the project (micro-) and national (macro-) levels; and 4) provide for the production of specific outputs in education and training, expanding the knowledge base, etc. A secondary purpose was to foster an effective pattern of cooperation between Auburn University, the University of Rhode Island, AID, and other key institutions related to common fishery problems particularly in the areas of planning, marketing processing, and nontechnical constraints on fisheries production.

Number of U.S. Personnel: see annual reports

Training Programs: see annual reports

Outputs: see annual reports

Report: Annual fiscal year reports for 1971-1977 prepared by the International Center for Aquaculture, Auburn University, and the Final Report dated September 29, 1978, written by E. W. Shell, Head of the Department of Fisheries and Allied Aquacultures and Director of the ICA.

Abstracts: The final report summarizes the activities of the International Center for Aquaculture (ICA for the period July 1, 1977, to April 30, 1978, and for the entire grant period. The report discusses the graduate program, short-term technical assistance services, personnel involved, research conducted, publications, grant-related activities, utilization of institutional response capabilities, long-term technical assistance services, and visitors to the center.

931-0242

NOAA Advisory Services

Objectives: To provide technical assistance for development and implementation of fisheries activities in developing countries.

Time Period: 10/75-9/78

Level of U.S. Funding: \$392,000

Summary: Contract with the National Oceanic and Atmospheric Administration (NOAA) to provide program support to the Agriculture and Fisheries Division of AID's Development Support Bureau.

931-0526

Oceanic Foundation
Artificial Propagation of Milkfish

Objectives: To develop improved aquaculture techniques to eliminate dependence of aquaculture centers on capture juvenile fish. To develop methods and systems that will result in the capability to breed milkfish.

Time Period: 1/75-12/79

Level of U.S. Funding: \$1,224,000

Summary: Activities of the program include 1) establishing broodstock in captivity; 2) establishing conditions for spawning; 3) inducing spawning by hormone injection; 4) establishing conditions for larval rearing in the laboratory; 5) developing practical methods for large-scale fry production; 6) determining the economics of hatchery operation, and 7) conducting health care and pathology research.

Type of Equipment or Knowledge Transferred: Research on artificial propagation of milkfish.

Recipients: Oceanic Foundation

Outputs: Yearly research programs

Evaluations: Project Evaluation Summary, 9/78. Review team consisted of C.P. Idyll, NMFS; J. Hunter, NMFS; D. Mitchell, AID; M. Rechcigl, AID; S. Wishik, RAC member.

"On a year to year basis planned research has been accomplished and while the results of this successful experimentation have identified additional problems not anticipated earlier, steady progress toward accomplishment of the underlying objective has been made."

The team conducted a thorough review of research progress and scientific competence of the contractor. A revised set of research plans for the fifth year were developed in consultation with the review team.

"Contract work given an overall rating of satisfactory. There have been a number of disappointments, logistical problems and in the early stages of the project poor planning on the part of the contractor and by AID; nevertheless the contractor has generally been responsive to the terms of the original contract and to modification of the research plan suggested by the project manager and the 3 review teams." Other evaluations were conducted in May 1976 and March 1977.

931-0787

Auburn University
Increasing Fish Production By Improved Fishcultures, (AID/csd-2270)
Basic Ordering Agreement

Objectives:

1. Develop an appropriate technical staff
2. Locate sites in selected countries for development of research and demonstration stations
3. Build and staff demonstration and research stations
4. Begin adaptive research
5. Determine major constraints on aquacultural development
6. Extend information throughout host countries
7. Develop a network for exchanging information between host countries

Time Period: 6/69-7/74

Level of U.S. Funding: \$834,601

Summary: This contract replaced AID/csd-1581, Increased Fish Production through Improved Fish Culture in Less Developed Countries. This contract is structured as a Basic Ordering Agreement, which allows USAID missions desiring technical services in aquaculture or other fisheries to request and pay for those services by issuing a task order (simple process) or through formalization of a separate contract, which takes a much longer period of time. Task orders 1 and 6 are the funding mechanisms for the world wide contract. Attached are descriptions of the various task orders and contracts for Auburn's country projects.

Report: Annual Reports to AID for 1971, 1972 and 1973.

Evaluation: Assessment of Auburn University's Aquacultural Activities, March 4, 1974 by James A. Urano, TA/AGR.

- Annual Report 1971** Task Order 2 (Thailand)
8/1/69-12/31/70 for \$23,647 for 5 man-months to provide training in various subject matters for fisheries biologists of Thai Fisheries Department and for reviewing previous research and assist in planning future research and extension activities.
- Annual Report 1972** Task Order 3 (Brazil)
10/15/69-10/15/70 for \$28,015 Amendment No. 1 extended T.O. 3 to 10/15/71 for \$43,913. Advisor in fish culture to Government of Brazil, 24 man-months of technical services
- Annual Report 1972** USAID Brazil Project
The USAID/Brazil sponsored project in Northeast Brazil, staffed with two ICA specialists during 1972. Primary goal to increase fish production through improved aquaculture and improved management of existing reservoirs.
- Annual Report 1973** Counterpart training opportunities for Brazilian staff provided by USAID/Brazil in form of short term tours at ICA. Four Brazilian biologists took part in a special 2-month training tour in U.S.
Progress to date:
A separate Department of Fisheries established within DNOCS, thus improving communication, cooperation, and enthusiasm for the aquaculture program.
Adaptive research at Pentecoste Fishculture Station conducted during past year indicates good potential for fishculture.
Fishculture extension program producing good results.
- Annual Report 1971** Task Order 4 (Brazil)
8/25/70-8/31/72 for \$65,451. Advisor in fish population dynamics and reservoir management to Government of Brazil, 24 man-months of technical services.
ICA recommended to AID/Brazil that the fishculture position be continued for another 2-year period and that an extension fishculturist position be added to complement the on-going research program in aquaculture.

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Dr. Davies investigated the reservoir fishery in selected large impoundments in northeast Brazil. Emphasis was on determining the standing crop of fish, species composition, and improved harvest techniques. (End of tour report available) The reservoir investigational project phased out after completion of Dr. Davies tour.

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Task Order 5 (Peru)

2/15/72-4/15/72 for \$4,631. Technical services of 1 man-month in country for specialist in aquaculture to advise Peru's Ministry of Fisheries on aquaculture development.

Dr. Moss was in Peru for March 1972 and provided technical services to the Ministry of Fisheries. Salary support paid by T.O. 5 while in Peru but on returning, during period of preparing final report, his salary was covered by AID/csd-2270.

Published report, "Aquacultural Developments in Peru."

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Task Order 7 (Thailand)

10/1/71-1/15/72 for \$16,500 for 3 man-months of technical services for reviewing current research projects and planning future research and extension activities. (see Task Order 2)

Short-term technical services provided under AID/csd-1581 through USOM/Thailand. Seven trips to Thailand involving 2-3 staff members on each trip. Technical services were provided to review existing programs in fisheries research and extension and to develop plans and establish priorities for future extension and research programs. Also, short-course training programs carried out for Thai fisheries biologists at fisheries stations throughout Thailand.

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1972

Task Order 8 (Brazil)

3/25/72-4/30/74 for \$91,285. Technical Services; 24 man-months for fishculture extension specialist and 24 man-months for fishculture research advisor to Government of Brazil.

Three staff members served as long-term advisers during 1972.

Basically, this task order continues the position of fishery adviser in aquaculture research but also provides for increased emphasis in the area of aquacultural extension by authorizing employment of a fishculture extension specialist. Mr. John Jensen, a former Peace Corps volunteer affiliated with a fishery cooperative in Brazil for 2 years, was hired to serve as adviser in fishculture extension. Dr. Lovshin was

employed as fishculture research adviser; arrived at post 6/16/72.

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Amendment No. 1 extended Task Order 8 to 6/30/74
Amount Funded: \$116,321

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Report
1972

Task Order 9 (Thailand)

9/1/72-2/28/73 for \$14,400 Technical Services:
One man-month each for fisheries biologist and fisheries nutritionist to assist personnel of Thai Department of Fisheries. One man-month on campus to complete work on length-weight relationships of Thai fishes.

Drs. Shell and Lovell carried out work assignments in October 1972. Dr. Shell concentrated his efforts in reviewing the entire research program of the Inland Fisheries Division of the Thai Department of Fisheries with emphasis on improving the effectiveness of the research program. Dr. Lovell worked with biologists at the Annual Bangkok Fisheries Station and other selected fisheries stations in formulating economical rations for feeding fish and designing experiments to test various diets. (Report available)

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AID/1a-688 (El Salvador)

9/27/71-9/30/72 for \$80,003 Technical Services.
12 man-months for an adviser in inland fisheries to the Government of El Salvador plus 4 man-months short-term services.

AID/El Salvador requested assistance from ICA to review the status of existing fisheries programs and to assess the potential for fisheries development and aquaculture. Dr. Moss carried out a study and recommended a program to AID mission.

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1972

Amendment No. 1 extended contract to 12/31/72. Two-week visit by Dr. Moss to review progress of the renovation program of Santa Cruz earthen ponds as prepared by Fisheries Department of the host country. Salary supported under 1a-688 for Dr. Moss, but upon his return support reverted to csd-2270 despite several additional days work.

Dr. David Bayne employed 1/1/72 to serve as adviser in inland fisheries to Government of El Salvador. He coordinated fisheries development consisting of three major work programs: 1) investigations of the fisheries resources of the major lakes and natural waters; 2) the aquaculture research program at Santa Cruz Porrillo Fishculture Station; 3) the renovation and expansion program at the fishculture station.

Progress: Satisfactory for phases 1 and 2, limited progress made in construction of new ponds at Santa Cruz station due to inadequate funds for rental of earth moving equipment. Six new earthen ponds completed and a deep-water well drilled. New equipment added to laboratory improving the facility.

Annual
Report
1973

Amendment No. 2 extended contract to 3/31/73
Amendment No. 3 extended contract to 12/31/73
Amount funded: \$42,996

Financial support for the Cooperative Fisheries Project by the Government of El Salvador has vastly improved. Total capital improvement funds by GOES is \$107,600. Renovation of existing pond facilities at fishculture station completed in 1972. Plans prepared by project engineers and construction initiated on 15 of 30 concrete ponds. Renovation of the main laboratory building completed. Research begun to evaluate systemically the culture potential of selected native species of fish. Farm pond evaluation study begun in 1971 completed and results and conclusions prepared for publication.

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1971

AID/la-684 (Panama)

8/18/71-9/30/72 for \$119,881 for technical services. 12 man-months, for an advisor in fishculture to Government of Panama plus 3 man-months short-term services.

Following a survey carried out 4/27-5/22, 1970 by Drs. Smitherman and Moss, the Government of Panama and AID mission agreed to cooperate in sponsoring aquaculture project. Two subsequent visits organized the project.

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Amendment No. 1 Extended Contract to 3/31/73
Amount Funded \$93,091

Dr. Lovell in Panama for 1 week to assist Auburn University project manager, Dr. Smitherman in designing a fish feeds laboratory planned for future construction at the fishculture research station at Divisa. A report prepared for distribution to appropriate USAID and Government of Panama officials.

Original plans for the project called for the construction of aquacultural facilities: 1) a fishculture research facility to be developed at the Tocumen Agricultural Experiment station with cooperation and support from the Faculty of Agronomy, University of Panama and 2) a combination fish hatchery and demonstration and extension aquacultural facility to be constructed at a suitable inland site near Santiago.

After Dr. Smitherman's arrival, Government of Panama decided that entire faculty of agronomy at University of Panama should move inland to develop an agricultural experiment station that would be of more value to larger group of farmers.

Progress to date:

Earthen pond complex at Divisa nearing completion with 33 experimental ponds. The fisheries adviser with assistance of ICA staff prepared a basic design for a field laboratory in order that construction could begin in 1973.

Funding for two participants at Auburn University Dr. Smitherman remained in Panama for 18 months, returning to Auburn on 8/4/73. Project will be serviced until 2/74 through periodic short-term visits. Three Panamanians receiving special training at Auburn under contract funds.
Government of Panama funding \$143,100

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1971

AID/ea-180 (Philippines)

7/23/71-6/30/73 for \$161,043. Technical services for 24 man-months with an adviser in fisheries to the Government of the Philippines to give training and supervise the construction and research at both a freshwater and brackish-water aquaculture research station.

Three Philippine students started training in fisheries at Auburn in September 1971.

Original survey to assess the potential and need for aquaculture development in the Philippines by two staff members conducted from Sept.-Oct. 1967. They recommended the establishment of two aquacultural experiment stations. Three years passed before Auburn received indication that the Government of the Philippines and the USAID mission wanted to proceed. The Auburn team returned in July 1970 to determine sites for the stations.

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Amendment No. 1 Provided additional funds of \$83,085

Amendment No. 2 Provided additional funds of \$4,530

One-week visit by Drs. Lovell and Shell to review the Inland Fisheries Project. Conferences held with appropriate officials of USAID/Philippines, the University of Philippines College of Fisheries, Central Luzon State University, and Auburn University contract representatives.

Dr. Schmittou arrived in Philippines Sept. 1, 1971, and assumed responsibilities as Chief of Staff and Project Leader. Dr. Grover was employed under this project and arrived in Manila Jan. 4, 1972. Progress to date: two aquacultural research facilities are under

construction. The freshwater research station (located at central Luzon State University) consists of 27 quarter-acre and 33 tenth-acre earthen ponds. Construction of ponds 80% complete. A deep well drilled to supply water to fish ponds during dry season. Construction nearly completed on the combination administration-laboratory building.

Construction continuing on initial 37-acre portion of the brackish-water facility at Leganes on Panay Island. Dikes for ponds completed and main water supply canals 80% complete. Well drilling operations have not been successful and a new contract for combined drilling being processed.

An extensive field research program initiated by Auburn staff and counterpart personnel of University of Philippines, College of Fisheries, in privately owned ponds, with selected fish farm operators, with good success. Some tests lost due to destructive typhoon rains. Research also conducted in a Philippine Fisheries Commission (PFC) demonstration fish farm at Iloilo in cooperation with PFC personnel.

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Amendment No. 3: extended contract to 6/30/74
Amount Funded \$113,259

Under the participant training component, 8 staff members of the U.P. College of Fisheries and Central Luzon University enrolled in advance degree programs at Auburn.

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ICA is the recipient of seven fisheries projects supported by AID missions with a total budget of \$470,288

Outputs:

- 1) 15 staff members of the Department of Fisheries and Allied Aquacultures participated in short-term assignments in 27 foreign countries.
- 2) 45 major technical reports prepared by ICA staff.
- 3) 18 surveys and other technical reports prepared during the period July 1, 1970 to December 1, 1971.
- 4) 33 scientists and other visitors from foreign countries visited ICA during the period 7/1/70 to 12/1/70.
- 5) 15 foreign students enrolled in graduate and special study programs.

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During 1972, ICA staff provided assistance on a short-term basis to USAID missions and host country governments in Brazil, El Salvador, Nicaragua, Panama, Peru, Philippines, and Thailand.

At the request of USAID/Nicaragua, a fisheries survey was conducted on Lake Nicaragua. Staff - Dr. W.

Davies (Chief of Party of AID Brazil project) and Mr. Pierce (AID/Wash.). Salary support for Davies under AID/csd-2270. Services of Mr. Pierce made available at no cost.

Seven professors on long-term assignments on cooperative projects in Brazil, El Salvador, Panama, Philippines. Backstopping services on campus increased. Four main years of technical personnel needed annually for backstopping rather than 1.3 man-years.

Technical Report published.

Programs arranged for AID-sponsored visitors. 14 visitors during 1972.

Participant Training Programs

Twenty-four foreign students enrolled in graduate and special study programs. Funding for these students came from foreign countries and AID missions.

Expenses and Proposed Budget - ICA difficulty with inconsistency and inadequacy of funding for the level of effort devoted to activities carried out under centrally funded project. Level of funding required is \$200,000 annually. Budget submitted for 1973-79.

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1973

For project to date, foreign work consisted of 19 man-months of short-term services provided by 29 staff members in 39 countries. Fifteen major reports prepared and distributed to USAID missions and host country governments.

931-1050

Fisheries Development, ICLARM

Objectives: To increase the production of high-quality protein foods and provide improved income and employment opportunities for disadvantaged people in developing countries. To provide the mechanisms needed to advance the pace of research and development aimed at achieving optimum output and productivity from the aquatic environment.

Time Period: 3/79-9/82

Level of U.S. Funding: \$800,000

Other Funding: Total \$5,000,000

Summary: Initial funding for a 3-year period to support the International Center for Living Aquatic Resources Management (ICLARM). The U.S. contribution will not exceed 25 percent of the core support required for programs that are consistent

with AID objectives. Rockefeller Foundation will provide core assistance. ICLARM is located in Manila, Philippines. Multi-donor project.

931-1155

Small-Scale Fisheries Development Conference

Objectives: To support small-scale fisheries conference held at the University of Miami to identify opportunities or constraints on small-scale fisheries production systems and to determine what inhibits or enhances artisanal fisheries development in LDCs.

Time Period: 11/77

Level of U.S. Funding: \$46,500

Summary: University of Miami handled the arrangements for the symposium. Approximately 100 Americans and 100 foreigners attended.

Report: Published Report, Conference on the development of small-scale fisheries in the Caribbean region.

931-1156

Report of the International Management Study Group to the Council of the Southeast Asian Fisheries Development Center (SEAFDEC)

Objectives: The Southeast Asian Fisheries Development Center established an International Management Study Group to review and evaluate the agreement, administrative and financial regulations, procedures, functional structure, etc., of the departments and particularly the Secretariat of SEAFDEC.

Time Period: 12/78-9/79

Level of U.S. Funding: \$49,000

Summary: USAID grant to cover costs involved to produce report presenting the findings, conclusions, and recommendations of the International Management Study Group. Composition of the study group:

- a) The council agreed that the mission be composed of three members all financed by AID, whose nationalities were not of member countries of SEAFDEC but that one should come from southeast Asia;

b) The group leader should have a distinguished career in fishery administration and long experience in fisheries research and development. The second specialist in institutional management and the third a legal expert. Terms of Reference:

"1. Evaluate the existing provisions of the Agreement establishing the Center: including its Administrative and Financial regulations and other regulations currently used by the three departments in so far as they relate to the management of the Center and recommend appropriate measures to strengthen the Center;

"2. More specifically, examine the current administrative and financial procedures of the Secretariat and the three Departments and suggest ways and means by which these may be improved;

"3. Examine the management structure of SEAFDEC, in particular the scope of activities of the Secretariat, its power and responsibilities. Where modification and/or restructuring of the secretariat is desired, to suggest ways and means therein this can be effected and to recommend suitable funding sources to further support the Secretariat's activities."

Report: September 1979. Transmitted by Roy I. Jackson, Leader of the International Management Study Group to Dr. Deb Meanasveta, Secretary-General, SEAFDEC.

931-1306

Fisheries and Aquaculture Collaborative Research in the Developing Countries, Title XII

Objectives: To develop a statement of research needs in developing countries and of U.S. university capabilities.

Time Period: 1977-78

Level of U.S. Funding: \$276,000

Summary: The report identifies development assistance needs in fisheries and aquaculture as seen by developing countries, identifies the set of needs that might best be addressed through Title XII collaborative research, establishes relative priorities, and presents budgetary requirements for their accomplishment. A workshop was held in Denver, Colorado, December 14-15, 1977, with 110 participants. The workshop's purpose was to provide an opportunity for interested university representatives to interact with the staff of the Board for Food and Agricultural Development and members of the Joint Research Committee and AID concerning

the scope and intent of Title XII legislation and collaborative research support programs and to provide for an exchange of news on fisheries and aquaculture research needs and priorities in the developing countries.

Report: Fisheries and Aquaculture Collaborative Research in the Developing Countries, A Priority Planning Approach. Kenneth B. Craib and Warren R. Ketler, Editors; Resources Development Associates, Los Altos, CA, August 1978.

931-1155

International Workshop on Tropical Small-Scale
Fishery Stock Assessment

Objectives: To provide advice on research needs of developing countries in fishery stock assessment (identified as a high-priority subject for consideration) that might be met through collaborative research support programs within the framework of the Title XII program.

Time Period: 6/79-4/80

Level of U.S. Funding: \$49,000

Summary: Specific objectives are to hold a workshop, to encourage dialogue between developing country fishery administrators who must make the best of whatever information is available to them and theoreticians who can more effectively propose new approaches to assessment if they are made more aware of the practical problems that inhibit data collection and analysis in developing countries.

Number of U.S. Personnel: 15 from U.S. universities

Number of Foreign Personnel: 10 from international institutions

Report: International Workshop on Tropical Small-Scale Fishery Stock Assessment, Report of the Steering Committee, January 7, 1980.

931-1314

Auburn University
Aquaculture Technology Development (Grant AID/DSAN-G-0039)

Objectives:

1. To ensure continuation of high-quality university educational program oriented toward freshwater aquaculture in developing countries;

2. To make the program available to students in developing countries;
3. To use special capabilities developed at Auburn to transfer existing aquaculture technology to developing countries.

Time Period: 5/78 - 4/81

Level of Funding: \$882,000

Summary: The AID grant was effective May 1, 1978, but was not actually approved until early September 1978. The grant was awarded for a three-year period. Originally the grant was to include funding for certain technology transfer activities in developing countries, but this component was eliminated and was included in a separate University Services Contract (AID/DSAN-C-0053). This grant is a continuation of AID-Auburn cooperation in developing technology in freshwater and brackish-water aquaculture appropriate to local needs, in developing programs for the dissemination of that technology, and in actual technology transfer on a worldwide basis.

Outputs:

1. Maintain a strong graduate educational program in freshwater aquaculture oriented to the needs of developing countries and to maintain positions for at least 35 students from developing countries in the programs.
2. Provide opportunities for special training between academic quarters and provide scholarships to selected students.
3. Offer a five-month, noncredit, Aquaculture Training Program primarily for professional fishery workers from developing countries.
4. Prepare manuals and other materials to be used in technology transfer activities.
5. Develop and present a series of short courses and seminars.
6. Conduct an evaluation of aquaculture development programs in selected countries in West Africa.
7. Provide opportunities for short-term advisory services in developing countries.

Report: Annual Report for the period May 1, 1978, through April 30, 1979, E. W. Shell, Director, ICA, November 1, 1979.

Abstract:

A total of 35 staff members and graduate research assistants were funded to some degree, but only 3 received more than half of their total support for the year.

Grant funded staff were responsible for teaching 10 of the 23 formal courses taught during the year.

Graduate student enrollment increased over 250% since the 1970-71 academic year. The enrollment of foreign graduate students increased twice as fast as the enrollment of all students in the same period. During this report period, 39 new graduate students were admitted to the program, 17 being foreign students.

Degrees were awarded to 47 students; 16 foreign students received graduate degrees; 14 of the 16 students returned to their respective countries after graduation. One other student received a scholarship to study at URI and another is remaining in the U.S. until her husband completes his degree.

Three postdoctoral fellows from developing countries were at Auburn during the year, supported by other agencies, but grant funds were utilized to provide opportunities to participate in research projects, to provide laboratory supplies, equipment, travel to field research areas and faculty time required in support of their research and training activities.

Grant funds were used to provide a tuition fellowship for one man supported by the Latin American Scholarship Program of American Universities.

Grant funds were used to provide staff time, travel, and other costs associated with providing graduate students with the opportunity of visiting selected fisheries and aquaculture operations in the southeastern United States.

The university provided special training opportunities for a number of visitors who came to obtain information about international fisheries and aquaculture development.

The third annual Aquaculture Training Program (5 months) was conducted. Seven students attended.

Work on three manuals was undertaken. Five reports were prepared.

Grant funds were used to initiate a quarterly newsletter. The current mailing list totals 595, of which 245 were overseas locations. The first issue was distributed in early 1979.

Two short courses were conducted in Colombia in Spanish.

The ICA responded to 42 requests for short-term technical assistance during the year.

