

The Socio- Economic Impact of Fisheries Programs in El Salvador

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Agricultural Experiment Station

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SUMMARY

The Fisheries Resource Service of El Salvador has made considerable progress since 1971 when the Auburn USAID Project was set up. The more than tenfold, real-term increase in the fisheries budget from 1972 to 1977 illustrates the government's commitment and interest in the program. The Fisheries Resource Service has excellent experiment station facilities and hatcheries with other appurtenant infrastructure to enable a favorable long-term impact on the nation's economy. New credit availability and new information opportunities through extension should widen market opportunities for the fisheries sector of the economy. The Service still has many opportunities for improvement to better serve the populace of El Salvador.

Significant problems remain in several areas as follows:

1. The manpower of the Service is sparse, both for ongoing experimental work and for extension.

2. The mean production of fish per hectare in both communal ponds and private farm ponds is low in comparison with the potential.

3. The total volume of aquacultural fish production needs to be increased to bring about a more efficient market system in fisheries.

4. The price of high-quality fish is still too high for purchase by the rural poor.

5. Personnel who are highly trained in the scientific aspects of fisheries spend large proportions of their time on administrative duties, which leaves little time for contributions in their own field of endeavor.

6. Aerial application of pesticides continues to interfere with the functioning of fingerling production in the Santa Cruz Porrillo area and endangers breeding stock of the experimental unit.

7. Fisheries law enforcement needs to be enhanced to curtail illegal capture activities.

The following recommendations are made with respect to the Fisheries Resource Service.

1. Training in fisheries development and management should be intensified, especially at the lower levels of the Service. Every effort should be made to keep aquacultural and fisheries scientists as close as possible to the work for which they were trained. Use of personnel trained in fisheries for teaching purposes seems to be a valid allocation of resources.

2. Extensive economic studies should be made a part of all programs involved in fisheries development in El Salvador. This action would be in line with recommendations by officials of the Latin American Bureau and Technical Assistance Bureau of AID, the Inter-American Development Bank, The Banco de Fomento Agropecuario, the World Bank, the U.S. Department of Commerce, and others.

3. Outside expertise probably will be required in setting up the economics division under a proposed "directoriate" organization of the fisheries program. The plan should be designed to include micro- and macroeconomic analyses with the intent of optimizing in the allocation of the country's socioeconomic goals. The economics group should be so organized that it provides input to project and policy changes before they are effected. All experimental work should be done under a framework which is amenable to the extraction of economic data useful in decisionmaking and policy analysis. Opportunity cost of the nation's scarce resources should be considered in all major project

C O N T E N T S

	Page
SUMMARY	2
INTRODUCTION	3
THE SURVEY	4
Background	4
Field Observations	4
FISHERIES RESOURCE INVENTORY	6
Aquacultural Programs	6
Capture Fisheries	7
GOVERNMENT COMMITMENT, FINANCING, AND POLICY CHANGES	8
Budgets and Financing	8
Institutional Changes	10
RECENT PROGRESS AND DEVELOPMENT PLANS	10
New Facilities and Programs	10
Extension Programs in Farm Ponds	11
The Peace Corps	12
FISHERIES PROGRAM APPRAISAL	12
General Impressions	13
Problem Areas	13
Recommendations	14

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expenditures. Social costs and benefits should be considered in impact analyses to the extent of data limitations.

4. The USAID should seriously consider the possibility of providing additional assistance to the Government of El Salvador in various program areas including extension and economics. Training opportunities in academic and practical fisheries programs should also be provided for selected staff of the Fisheries Resource Service of the Ministry of Agriculture.

The Socioeconomic Impact of Fisheries Programs in El Salvador

Donald R. Street*

INTRODUCTION

SEVERAL PROGRESS REPORTS on the Auburn-El Salvador-AID Project have been published, and this report will not attempt to duplicate these works. Some of the data will be updated to 1977, and new projects, installations completed, and programs begun since the last progress report will be indicated as accomplishments of the overall program. Some of the data from past reports will be used as trend bases and for comparative baselines in policy-change determination.

The fact that El Salvador has a protein-deficient diet has been well documented. This report will not dwell on the obvious need to remedy this deficiency.

The present survey was completed during a 3-week period during August 1977.¹ The limited time and travel opportunities did not allow consultations with all agencies of interest. The persons involved in fisheries also had their own jobs to do and sometimes could not supply all of the information at the time and in the form requested.

On-site visits were made to experiment stations, communal ponds, farm pond installations, private cage fish culture operations, cooperative cage fish culture operations, brackish water experimental programs, and other facilities. New construction in progress was observed at several sites. Research underway included fingerling production, feeding studies, fertilization rates, stocking rates, hybrid fish culture, shrimp studies in brackish waters, and types of cages for aquaculture.

In addition to the people involved directly in USAID and the Fisheries Resource Service, interviews were held with banking and financial institutions with an interest in fisheries, other agricultural officials, private fisheries personnel, and Peace Corps volunteers.

The Government of El Salvador (GOES) has become vitally interested in enhancing the welfare of its populace through fisheries improvement. This change in interest and attitude is manifest in several ways. One measure is the change in monetary input to the fisheries program. Personnel changes and institutional changes leading to new laws and credit structures are other indicators of government commitment. The degree of concern leading to better statistical data availability is further evidence of the government's interest. Changes in the bureaucratic structure of the fisheries related programs are also indicators of commitment.

Monetary and personnel inputs to the various fisheries programs are costs and make no implication with respect to benefits. A complete cost-benefit analysis could bring about sizable reallocations of resources within an oppor-

tunity cost context. As the programs become well established, new analyses will be necessary on feasibility.

A related matter which leads to complications in measurement is the fact that some of the benefits from economic development are of a public type or include social spillovers beyond the private market sector. These types of returns call for public subsidy to enable an optimum allocation of private and public expenditures in the programs. The majority of the benefits are probably of the private nature, however.

The fisheries program in El Salvador entered the 1970's at a low level of development. In 1971 Moss² completed a survey and made certain recommendations for a development program. While of necessity the program emphasized the production aspects of fisheries in El Salvador, Moss' report stated: "It is important that field studies be oriented toward assessing the economic aspects of the fisheries and delineating the status of the harvest." All economic problems are people problems. A survey of resources is a prerequisite to awareness of the populace on the potential to be developed. Optimum exploitation of the inland waters could furnish a sizable increment to the diet of a protein-short population. In many instances, the resources in fisheries may have few alternative opportunities. Any gains in such a setting are a net addition or have a zero tradeoff with other enterprises.

The next step after the resource inventory is development of an infrastructure to enable the populace to make use of the productive potential. Demand for the product should be increased in step with capital accumulation and increased productivity to help prevent serious inflationary problems. It is of paramount importance to plan critical paths to avoid large new spending without any new consumer products.

Fisheries development starting from the level of El Salvador's program calls for the creation of a complete self-supporting system. Maximum effectiveness in one part of the program can only be attained if complementary infrastructure changes are made in other parts of the program. The raw products are of no use unless they can be transported (or grown) where the people are. The populace will not purchase the products unless sufficient information is made public--there must be an awareness of the product. Sufficient financing must be available to encourage producers to take on private capital requirements for the job at hand. The most important prerequisite for development is the attitude, encouragement, and commitment of the government itself--reflected in other parts of the system as promoted by official action.

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¹Actual dates in-country were August 8-26, 1977.

²Moss, D. D. 1971. Inland Fisheries Survey Report for El Salvador. Project AID/csd-2270. International Center for Aquaculture, Auburn Univ. (Ala.) Agr. Exp. Sta., Auburn, Ala.

The fact that a resource inventory has been taken is an indicator of the new concern in the government. This type of policy change can affect the economic well-being of the country in at least three ways: (1) it allows unused resources to be put to use, (2) it allows a reappraisal to determine if land and water resources are being put to their "highest and best use," and (3) it allows a more sensible reallocation of other resources leading to employment of labor, for example, which had no work opportunity in the absence of opening up the complementary resource base.

THE SURVEY

The author was given the opportunity to work with other fisheries officials and related economic development and financial professionals as a part of the background to the present study. In-country travel also complemented that phase of the study.

Background

In anticipation of the study in El Salvador, the author had a 1-week orientation trip to the University of Rhode Island, the World Bank, the Inter-American Institute of Agricultural Sciences, the Inter-American Development Bank, the Technical Assistance Bureau and Latin American Bureau of the U.S. Agency for International Development, the National Oceanographic and Atmospheric Administration of the U. S. Department of Commerce, and the Environmental Protection Administration. Interviews were held with economists and officials in the International Marine Resource Development Center at the University of Rhode Island, as well as with economists in the University's Department of Resource Economics. The author sought views of the interviewees on need for economic analyses in development programs involving fisheries and related resources in their respective domains of service.

A part of the summer was spent in reviewing literature and talking with professionals who had experience in advisory capacities in El Salvador. Technical advisors from Auburn University and the Peace Corps who had served in El Salvador were included in this group.

Field Observations

Observations were made by the author during the 4 days of field trips in El Salvador from August 15 through 18, 1977. The author was accompanied by a guide from the GOES at all times.

The first visit was to experimental communal ponds at Huerto Escolar in Ichanmichen in the Department of La Paz. The Communal Pond Program is supported by a government self-help group, Fomento y Cooperacion Comunal por Esfuerzo propio y Ayuda Mutua (FOCCO). Four ponds comprising a total area of 3,600 square meters were examined. A group of high school students study fish culture at the ponds, which are stocked with tilapia (*Sarotherodon aurea*) and guapote tigre (*Cichlasoma managuense*). A total of 28 students work in the project at maintaining and cleaning, sampling, and feeding of the fish. This project was formed jointly by the Fisheries Resource Service and the National Movement for Juvenile Service of the Ministry of Education.

A trip was made to the National Fisheries Station, Santa Cruz Porrillo, in the Department of San Vicente. Interviews were held with the senior administrator of the Station, then experimental ponds and fingerling production facilities were examined. The Station has well-equipped laboratories, numerous experimental ponds, fingerling production facilities, an aquarium, offices, meeting rooms, warehouse and storage space, and other apparatus necessary for a successful research, production, and demonstration operation. Problems of fish mortality due to insecticides have been publicized in previous documents. Cotton enterprises and aerial insecticide ap-



Brackish water ponds and canal at Puerto El Triunfo on Jiquilisco Bay.

plications have damaged fingerling production and endangered breeding stock of some species which require several years to produce. Fingerling production is lost 3 to 4 months out of each year. Attempts to extend a protective belt immediately surrounding the Station from 500 meters to 1,000 meters have failed.

Interviews were held with Lic. Juan Bautista Ulloa, the technical manager at the new Marine Experiment Station at El Triunfo in the Department of Usulután. The Station is located on the Bay of Jiquilisco and has a canal of brackish water to the pond and building locations. Six new experimental ponds had just been built on the location having an area of 2,000 square meters of surface water in each one. Plans for next year include 18 new ponds for brackish water experiments. Shrimp culture experiments were in progress in one of the ponds of the site and other ponds were to be stocked with tilapia on August 16, 1977.

The program at El Triunfo also includes preservation and research and conservation efforts on sea turtles and other marine and brackish water fauna in addition to the shrimp and tilapia experiments in the future. A sizable new building has been constructed with provisions for:

- A wet laboratory
- A biology laboratory
- A conference room and library
- Two dormitories for technicians
- A kitchen and dining facility
- Storage space

The fisheries program has been criticized for being slow to get equipment and accompanying facilities needed to operate the respective station installations. The building at the station in El Triunfo had not been furnished with equipment and library materials, but hopefully progress will be made in this phase of the work in the near future.

An interview was held with agronomist Rene Salgado Flores at the new Fish Hatchery Production Unit at Izalco in the Department of Sonsonate in the southwestern part of the country. This station is located adjacent to the Juvenile Center of the Ministry of Justice, which houses homeless

boys mostly between the ages of 14 and 18 years. The fisheries station contains 19 experimental ponds of 400 square meters of surface water each. Water is obtained from a river through a canal system. At the beginning of September 1977, about 300,000 *Sarotherodon nilotica* fingerlings were to be available from this station for distribution to private ponds.

Plans have been made for construction of an office and laboratory building at the site of the Izalco Station. New water supply canals were being built at the time of the visit and six workers had been promised for cleaning and trimming around the ponds. The Izalco Station will eventually assume a major role in supplying fingerlings to compensate for downtime of the experiment station at Santa Cruz Porrillo due to cotton poisoning.

Classes in fish culture are held on a regular basis at the Juvenile Center next to the Izalco Fish Hatchery for selected students. This activity serves as one method of providing trained workers to handle some of the jobs in the fisheries service. A part of the students attend high school and a select fraction could be sent to a university for further specialized training. The Juvenile Center is essentially a detention home and for that reason may not supply the best student prospects.

A private fish farm operation was visited near Sonsonate. This installation has 15 ponds with a total area of 4 hectares of surface water. *Sarotherodon aurea* have been produced there since 1976 and are marketed directly with Pavos, S.A., a commercial operation which deals mainly in production and marketing of turkeys. The installation includes 4 ponds for production of tilapia and guapote tigre fingerlings and 11 ponds dedicated to commercial production. Average fish production reported was 2,500 kilograms per hectare per year, with turkey manure serving as the principal nutrients.

A second fish farm installation was visited in Nueva Concepción in the Department of Chalatenango. This farm included three ponds which were being operated. The ponds average 300 square meters of surface water. The fish were sold directly to consumers at a price of ₡1.25



Private fish farm at Nueva Concepción in Chalatenango.

FISHERIES RESOURCE INVENTORY

An inventory of the major fisheries resources will give a better perspective to the overall operation of the program in El Salvador. The marine waters, freshwaters, and brackish waters afford opportunities for aquaculture and capture fisheries.

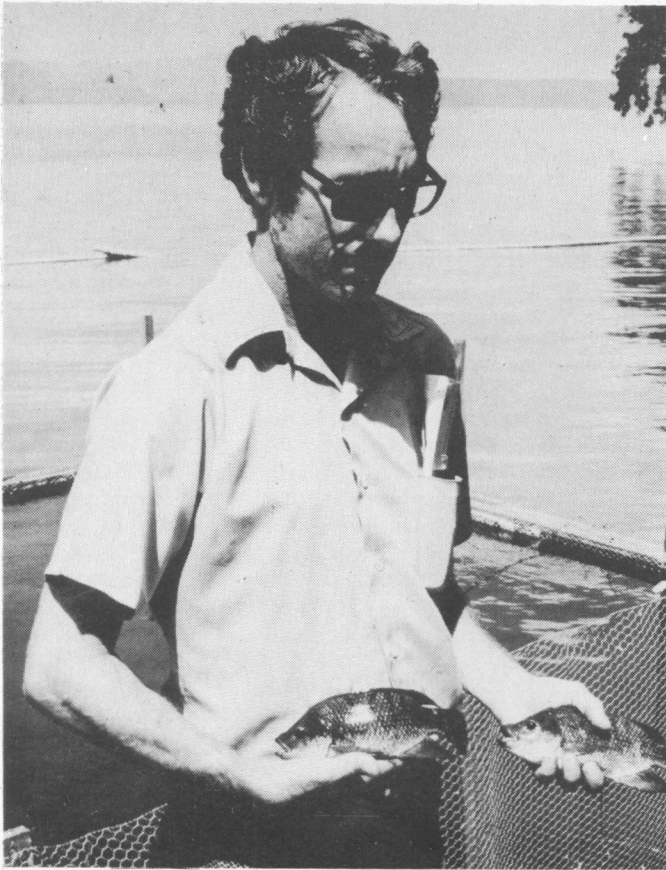
Aquacultural Programs

Aquacultural programs have been small in El Salvador, but they have a considerable potential for the future. Total combined production of private and communal ponds reported in 1976 was 37,388 pounds⁴. The private ponds had slightly more than twice the production of the communal ponds. One observer thought the above figures were too low, since his company handled 24,000 pounds of aquacultural fish products and he knew of others involved in similar programs. Opportunities exist for exploiting unused resources where new ponds can be constructed at low cost, for using previously built ponds for multiple purposes involving fish culture with other enterprises where costs can be shared or are already "sunk" for other purposes, and for increasing productivity by changing to the most up-to-date methods involving higher productivity of the resources. Results of recent fisheries work in Brazil may be relevant to the latter opportunity. The 70 communal ponds in existence in 1977 had an average size of 2,000 square meters of surface water. There were approximately 500 private farm ponds in existence in 1977.

A potentially valuable resource for future aquacultural use in tilapia production is the salt pond installations in El Salvador. A large area is available for a 6-month growing season for tilapia, allowing production of a marketable product for low- and middle-income families. Approximately 1,000 hectares are available for this purpose. The ponds purportedly are unused for salt production during the wet season, nearly 6 months, and they have a zero opportunity cost for all practical purposes since their costs have been sunk and are being amortized for other purposes. Any return above additional costs of the project are essentially free and should be explored and exploited pending adequate cost and returns analyses. The productive capacity could be much greater than that of other types of investment in facilities which must bear all of their own costs, either privately or socially, in terms of opportunities foregone.

Hughes⁵ reports productive capacity of salt ponds of 1,000 kilograms per hectare per year based on experimental work done in 1975. He also reported several problems in the tilapia production trials because of broken screens that permitted entry of predators and extraneous organisms into salt ponds. It seems that further trials on the salt ponds would be feasible in view of the protein-short diets, lack of fish in the family market basket, and the shortage of other fisheries related resources for the country.

Cage production in 1975 amounted to only 4,347 kilograms, all at Lake Ilopango. Slightly over half of the



Tilapia produced in private cage culture operation in Lake Ilopango.

per pound³. The owner was planning to build more ponds for future operations.

A visit to the Fish Culture Center at Atiocoyo in the Department of La Libertad allowed examination of three new experimental ponds of 2,500 square meters surface each. Final construction work was in progress on the canal and conduits for the water delivery system. Plans call for the construction of eight additional 2,500-square meter ponds in the latter part of 1977.

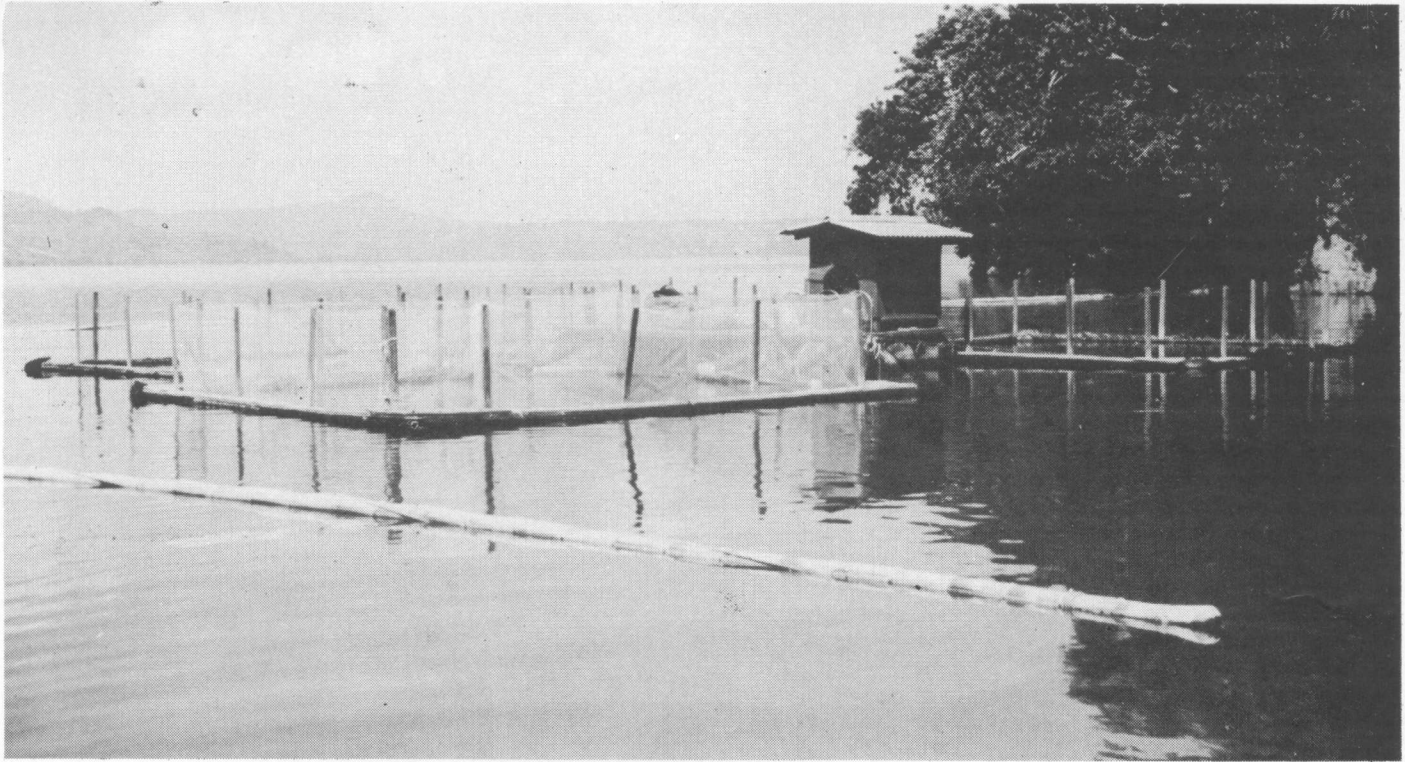
At Lake Ilopango, cage fish culture operations were observed for fisheries cooperatives and for the Fisheries Resource Service experimental cage operations. The government operation included 27 experimental cages, each with a volume of 1 cubic meter. Tests were involved with feeding pellets to tilapia with different shapes of cage structure. Seven commercial cage operations belonging to the Fisherman's Cooperative of Ilopango were observed. These cages had a volume of 30 cubic meters each. Production averages 27 kilograms of fish per cubic meter per year. The cage structures are made of steel angle and nylon meshing.

During the previous week a visit was made to a private cage culture operation on Lake Ilopango. It was reported that as many as 900 pounds of fish per day were sold at harvest time until the 5,200-pound supply was sold out. Security is a significant problem for cage culture operations. Thefts are fairly common in installations which are too small for a full time watchman. Location of the facilities is of extreme importance for this reason.

³One colon = \$0.40 U.S.

⁴SERVICIOS DE INFORMATICA y RECURSOS PESQUEROS. 1977. "Anuario Pesquero de El Salvador, 1976". Direccion General de Recursos Naturales Renovables, Ministerio de Agricultura y Ganaderia, San Salvador, El Salvador.

⁵HUGHES, DAVID G. 1977. Progress Report on Fisheries Development in El Salvador, August 1974-May 1976, Project AID/la-688. International Center for Aquaculture, Auburn Univ. (Ala.) Agr. Exp. Sta., Auburn, Ala.



Private cage culture facilities on Lake Ilopango.

production was by a private company, while the remainder was from the Fisheries Resource Service, Ministry of Agriculture and Livestock (MAG), and artisanal fisheries cooperatives. A representative of a private company involved in cage production reported an unlimited demand for fish products from cage culture and other aquacultural production. (Caution should be used in making inferences based on a few examples, however, since such a large demand might be expected to cause the price of fish to rise.) His company would be willing to buy large quantities of fish for resale pending availability. Researchers from the area reported that on occasions after running ads in local papers large numbers of people came many miles on buses and purchased as much as 1,360 kilograms of fish in 2 days at one sale point. The fish seem to be highly acceptable to the people who are aware of them. The cage type of fisheries affords a product mix of small fish that poorer families could purchase to increase consumption of high-quality protein, while the larger, more expensive fish would appeal to the higher income groups. It was estimated that 10,000 pounds per month could be moved easily on a regular basis by one company with a much greater amount around Easter and other holidays.

One problem with the communal pond program is that there are not enough ponds (only 70 have been completed). The communal ponds are financed by the government through FOCCO. Participating employees divide the total production according to how much work time they have contributed to the operation. A high demand for this type of installation is natural from the low-income populace, which the ponds serve, a group with practically no resources. The fact that they are highly subsidized by government financing does not necessarily mean the facilities are not economical, pending social benefits to the economy at large. According to data furnished by fisheries personnel, the 70 communal ponds in existence serve an

average of 20 families with a mean size of six. This investment gives direct benefits to 8,400 persons in the respective areas. The communal ponds also serve as a useful demonstration device for the private sector in aquaculture. Spillovers in terms of the demonstration effect to potential fish farmers complement research and extension efforts which need to be bolstered.

The Fisheries Service plans to build 15 hectares of communal ponds next year, and at least 500 new ones (100 per year) during the next 5 years. The average size of all communal ponds is planned to be 2,000 square meters. Some observers think the communal ponds are not economical because of their small size. Others object to the idea of communal ponds, arguing that no one person is really responsible for the operation and management and that an incentive for efficiency is lacking. One financial official noted that communal pond productivity in conjunction with the experiment station system should not be used for making inferences on productivity of communal ponds not closely associated with the well-managed ones at the research stations.

Capture Fisheries

Capture fisheries have probably been exploited to the maximum feasible extent, and may have been over-exploited. More research is needed on yields and optimum harvest rates. The estimated quantity harvested in the four principal rivers, the Lempa, the Jiboa, the Grande de San Miguel, and the Paz, in 1976 was 1,904 metric tons with a value of ₡2,513,940 at ₡0.60 per pound. Purportedly, farmers, low-income residents, and others have used dynamite, rotenone, and illegal diversions for capturing almost the entire fish population at once in certain parts of the streams. More strict enforcement of the fisheries laws should ameliorate a part of this problem. Lengths of the

respective principal rivers available for exploitation by local fishermen are given below:

River	Length, kilometers
Rio Lempa	295
Rio Paz	75
Rio Grande de San Miguel	65
Rio Jiboa	20

Artisanal fish catches in the principal inland lakes of Olomega, Guija, El Jocotal, Ilopango, and Coatepeque totaled 1,032 metric tons in 1976 with a value of ₡1,561,246. Fisheries experts report that the volcanic lakes are not fertile enough for rapid fish growth. Cerron Grande is a recent man-made lake in the country. The area of each of the six lakes is given below:

Lake	Area, hectares
Ilopango	702,000
Coatepeque	24,000
Guija	35,000
Presa 5 de Noviembre	14,000
Cerron Grande	135,000
Olomega	242,000

Artisanal catches going through the cooperatives at Puerto El Triunfo, El Tamarindo, La Libertad, Acajutla, and La Union were more than 780 metric tons and had a value of ₡1,103,318. Production from the principal estuaries of Jiquilisco, Jaltepeque, Barra de Santiago, Tamarindo, and La Union was about 754 metric tons and had a value of ₡1,867,662. Some double counting is apparent here since some of the estuary catches go through the cooperatives.

Coastal areas dedicated to shrimping operations to a depth of about 63 meters total about 12,209 square kilometers for El Salvador. This resource is the source of some lower quality fish taken as byproducts of shrimping operations. Some observers object to the purported serious waste of this byproduct fish due to lack of care and lack of storage facilities, commenting that this component of the shrimping catch could be very valuable to the lower income groups in El Salvador. Lack of economic feasibility of collecting these byproducts on a regular basis seems to be an impediment to their retention.

The fact that a considerable amount of fish is imported to El Salvador is not necessarily a problem in all cases, but should be examined carefully in terms of the nation's balance of trade and foreign exchange situation. Comparative advantage and specialization often necessitate trading of this type. This question should be considered in view of the purported wasting of byproduct fish by the shrimping fleet in the off-coast waters.

GOVERNMENT COMMITMENT, FINANCING, AND POLICY CHANGES

Several indications of progress in El Salvador's fisheries program are evident. Monetary input for operation and investment is one important indicator. New policies and attitudes are also apparent from changes in programs and personnel in the fisheries operations.

Budgets and Financing

The budget of the Fisheries Resource Service is given below in terms of current colones for each year from 1972 to 1977 (column 2) and the same data deflated to 1972

constant colones using consumer price index data for El Salvador (column 3):

Year	Current amount	Current 1972 amount
1972	₡ 124,858	₡ 124,858
1973	517,755	486,612
1974	450,670	362,275
1975	612,709	413,713
1976	1,677,952	1,057,977
1977	2,438,250	1,435,109 ²

¹One colon = \$0.40 U.S.

²Projected value based on inflation rate from 1975-1976.

Inflation has been a fairly serious factor in recent years as the data indicate. The wholesale price index made a much more drastic jump from 1975 to 1976 than did the consumer price index. This result is a warning about future inflation, since the wholesale price index generally leads changes in consumer prices. The wholesale prices increased by 34.8 percent from 1975 to 1976, while the consumer price index increased by only 7.1 percent.

Comparisons of 1977 values before and after deflation show that over ₡1,000,000 of purchasing power was lost to inflation when expressed in 1972 terms. This result is a serious problem for planners in times of severe inflation. The problem is worsened as the lag times increase from project plans to project initiation and completion.

An abbreviated fisheries budget of AID for September 1971 through April 1976 is given below:

Line item	Total budget
1. Salaries	\$ 64,072
2. Fringe benefits	9,318
3. Allowances	11,178
4. Travel and transportation	25,356
5. Other direct costs	4,294
6. Overhead	21,495
7. Equipment	25,627
TOTAL	\$161,340

Auburn University was the vehicle through which the AID investment was made. Auburn contributed to the project by providing technical direction plus various services and through personnel support.

The Inter-American Development Bank (IDB) has initiated a loan of \$5,300,000 for fisheries development. The project has matching funds from the government in the amount of \$1,435,000. This loan was approved in May of 1976 and supports two projects, one for five cooperatives at Acajutla, La Libertad, Puerto El Triunfo, El Tamarindo, and La Union. Loans are administered in cooperation with the Banco de Fomento Agropecuario (BFA), and the MAG Fisheries Development Office of the Government of El Salvador. The cooperative loans are used for better boats and equipment, cooling facilities, marketing, and transportation.

Inland fisheries loan programs are planned, mainly for tilapia production, to include 100 ponds. A goal to be attained, according to Sr. Hugo Jordan of IDB, is to increase fish consumption of the populace from 0.8 kilogram per person per year to 2.0 kilograms per person per year. He warned that it is difficult to change consumption habits, noting that it took 30 years to raise fish consumption from 3 kilograms per capita per year to 18 kilograms per capita per year in Chile.

Specific difficulties mentioned with respect to fisheries

were the technology jumps entailed in going from relatively primitive equipment to that with modern design. Fishermen who shift from a \$1,000 tree-trunk boat to a \$135,000 boat encounter serious adaptability problems. Changing consumer habits to include fish was the other major problem indicated. There also needs to be a leveling out of the supply of fish during the different seasons of the year. It was pointed out that the middle and low-income population must be reached in the outer rural areas as well as in the cities.

It was reported that the technical aspects of the fisheries cooperatives were good, except at Acajutla where there are no good places for building port facilities. The BID had rejected a cage culture project which was considered to be infeasible. Technical problems have been worked out, but the economic problems have not been studied enough, in the opinion of the financial officials. It was felt that the cage technology was too complicated for the low educational level of some of the cooperative people.

An executive level advisory was created in the government to assure compliance with loan requirements from the BID. A feasibility study must be made on all pond loan applications, which will force participants to get better data. Loan proposals are not considered in areas where cotton is produced in large quantities.

With respect to foregone opportunities, Jordan and Peace Corps volunteers mentioned the improper care for byproduct fish taken from shrimp boats. This product represents a potentially valuable commodity which could be dispersed to the poor population if a collection system could be devised that would prove economically feasible.

Jordan warned that fishermen were difficult to deal with in changing customs and technology. An example was related in which an educational program was held with farmers in a concentrated area by the Centro Nacional de Tecnologia Agropecuario (CENTA). After 15 years, a survey showed that 80 percent of the producers were still using methods practiced 50 years ago. He advised going slowly with technology changes and indicated that some of the cooperative aid programs were designed without consulting their participants. He recommended a plan of preselling to the cooperatives through better education. Jordan thought the Auburn Project should have a second phase related to the economics of fisheries.

A technician will be hired by BID to manage its fisheries projects. The BID had cooperated with FAO on studies which were precursors to loan programs. Sr. Oscar Morales Bonilla is project coordinator from Fisheries Development of the Ministry of Agriculture of El Salvador.

The BFA reported handling the following marine cooperative loans through their organization in cooperation with BID:

Area	Amount	Interest rate, percent
Acajutla	\$60,000	6
El Tamarindo	74,000	12
La Union	80,000	12
Puerto El Triunfo	69,000	12
El Pacifico	61,000	12

Acajutla got its loan first, before the cooperatives were required to pay the so-called commercial competitive rates. The minimum time for payback is 5 years and varies depending on time and conditions of the loan.

The BFA was organized from the older organization, Administration of Campesino Welfare (ABC), in 1974. Only one loan was made between 1967 and 1974. This was for \$81,000 in La Libertad, financed by First National City Bank. About 80 percent of the loan was for construction work. The BFA studies feasibility of loans including complementary transportation and other needed accompaniments.

The Fisheries Development Office of the MAG organizes and promotes fisheries cooperative development and advises in their management. It also helps with marketing, credit, and accounting methods for the cooperatives. Its inland fisheries program is expected to begin in January 1978. Many of the potential inland fish consumers were reportedly reluctant to eat fish due to bad quality commodity experiences and the image of spoiled or improperly handled fish from the past. There is a great need for education on handling and consumption of fish to have a sizable demand in the remote areas of El Salvador. With the higher quality and higher volume of product in the interior, the agencies hope to lower the price of fish by 30 percent. The BID recommends and approves consulting firms which advise in fisheries.

According to a news release on June 18, 1976, the Canadian economic development group CIDA contributed a 65-foot marine fishery vessel to El Salvador as a part of a \$3.8 million training project begun in 1973. The fishing boat was valued at \$1.2 million and would be used for training high school students in naval mechanics, fishing, navigation, and processing and storage of products. A coordinator and five instructors were provided for 4 years. Each of the Canadians had a counterpart who would eventually take over the teaching tasks. The author did not have time to include the CIDA operation in the busy travel schedule, but such an operation should be useful in stabilizing the overall fisheries program in El Salvador.

Several contributions were made to the El Salvador project through travel of outsiders on tours of the Fisheries Resource Service and through workers from El Salvador visiting other countries. Dr. David Bayne and David Hughes, as resident advisors, have made valuable contributions which have already been made explicit from the progress of the program. Dr. D. D. Moss visited El Salvador before the start of the Auburn-AID program and visited three times since, amounting to 32 days total. Dr. Bryan Duncan, of Auburn University, visited for 6 days during 1976. Dr. Harlan Lampe, of the International Center for Marine Resource Development at the University of Rhode Island, made three visits to the Fisheries Resource Service entailing 4 to 5 days each. Dr. John Sutonen made five similar visits of 4 to 5 days each, according to Fisheries personnel. Jose Cabrero studied in the United States long enough to earn the Ph.D. degree in fisheries and Cesar Abrego was in the United States long enough to get the B.S. degree in fisheries. Both studied at Auburn University. Dr. Cabrero spent 1 month studying fisheries programs in Ecuador and 1 week in Colombia for similar purposes with the United Nations Development Program (PNUD). Mauricio Ramirez spent 1 month in Ecuador on the same program. Rene Salgado studied fisheries for 2 months in Israel. The above types of contacts are invaluable in broadening the scope and depth of the personnel in fisheries. It is impossible to put a money value on such ventures, however.

Institutional Changes

The basic laws relating to fisheries are those contained in Circular #03 of the Ministry of the Interior, dated August 29, 1967. While these laws are specific on banned practices and capture methods in the inland fisheries, enforcement seems to be a severe problem. It was reported that a large number of enforcement personnel were needed to make possible the optimum development of the nation's water resources in fisheries.

On October 22, 1974, Executive Order Number 96 creating the National Fisheries Commission was signed into law by President Arturo Armando Molina. This Commission is charged with general policy determination concerning protection, conservation, and exploitation of fisheries resources, with the objective of promoting the development of fisheries related programs. The Commission is composed of the executive secretary of the National Advisory of Planning and Economic Coordination as coordinator, with other members consisting of the ministers of Foreign Relations, Economics, Education, Defense and Public Safety, and Agriculture. This Commission represents efforts made to attack resource development from a more organized standpoint through establishment of a basic infrastructure.

Executive Order Number 18, of February 7, 1975, created the Technical Fisheries Committee as a consulting group to the National Fisheries Commission. This Committee was charged with conducting studies for determining general features of fisheries policy, suggesting means for promoting national fisheries development, promoting conservation and rational development of fisheries resources of the country, and formulating recommendations of El Salvador's participation in international fisheries events and organizations.

The two committees above give an adequate integration of fisheries officials and other governmental sectors for the establishment of an overall development effort. The six organizations involved in the national Fisheries Commission will name the members of the Technical Fisheries Committee. The overall planning efforts should eliminate problems of independent sectoral planning, which could promote conflicting goals in the economy.

An important indicator of progress in fisheries development is represented by the setting up of a stronger statistical reporting system leading to the publication of the *Anuario Pesquero de El Salvador* in 1974. One observer noted that a decrease in production of fish was reported from 1975 to 1976, a factor which may add credibility to the reporting service. The statistical work and the initial reports were compiled by Lic. Mauricio Machon Corea. An elaborate fisherman census has been set up with data handling and analysis to be done by computer.

RECENT PROGRESS AND DEVELOPMENT PLANS

Several new facilities were recently put into operation by the Fisheries Resource Service and plans are in hand for further expansion to meet anticipated needs. Organizational restructuring of the Fisheries group is also anticipated.

New Facilities and Programs

The new hatchery and experiment station at Izalco were recently put into operation. The facility will relieve part of

the burden of the Santa Cruz Porrillo Station. The Izalco Station will concentrate on production of hybrid tilapia fingerlings. The fishery officials assumed that the two hatchery facilities could take care of needs for fingerlings for about 3 years. A new building for laboratories and offices will be built on the site in the near future.

At Atiocoyo, three new experimental ponds were completed and will be used in work with hybrid tilapia production. Several additional ponds will be built there in the future.

A complete new unit was built at Puerto El Triunfo including ponds, canal installations, and a building to enhance the brackish water research in aquaculture and related work. The laboratories, library, and other facilities had not been equipped at the time the author visited. Six of the ponds were to be stocked at mid-August 1977. A sizable expansion of the number of ponds is anticipated.

Several new communal ponds have been built, giving a total of 70 in operation. Experiments are in progress at the Ichanmichen communal pond project. While the average productivity of communal ponds has been low, fisheries researchers report rapid fish growth in the experimental communal ponds.

According to Dr. Jose Eduardo Cabrero, the new President of El Salvador, Carlos Huberto Romero, is extremely interested in fisheries programs for the country and is committed to their continued improvement. The fact that a fisheries man (Dr. Cabrero) is the new Director



Water supply conduit system construction at the Fish Culture Center at Atiocoyo, La Libertad.

of Renewable Natural Resources gives fisheries and aquaculture an opportunity for a hearing with someone who at least understands their problems.

Several new operations are proposed, along with a reorganization of the fisheries part of Renewable Natural Resources which affords opportunities for continued progress. The proposed reorganization, shown in the organizational chart, requires three new divisional directors, each of whom would receive a salary of €1,800 per month. In 1977, the 15 technical personnel had a salary fund of €150,000. The restructuring would require asking €80,000 more for reinforcement of personnel. The complete 1979 budget including the new directorate organization would require a 30 percent increase.

It was thought that streamlining of the program and its elevation to a "directorate" level would allow a more efficient attainment of goals which previously were subject of the Fisheries Resource Service. It was felt that the change was justified in view of the importance of technical assistance to increase the economic base through production of fish, crustaceans, and mollusks, the goal of protecting the aquatic fauna by legal means based on proven conservation policies, and the high level that fisheries has reached as an agricultural sub-sector in producing products containing animal protein.

In the new divisions proposed, the aquacultural group would include the Department of Fish Culture and the Department of Marine Culture. These two departments are concerned with the culture of fish, crustaceans, and mollusks in ponds, cages, and raceways in inland and estuarine waters.

The Capture Fisheries Division would handle all matters relating to artisanal fisheries through one department. It would deal mainly with technical assistance to artisanal fishermen. The Department of Fisheries Biology would study natural populations of fish, crustaceans, and mollusks in lakes, rivers, estuaries, and the ocean. The Department of Industrial Fisheries would study applied technology and its effects on marine populations.

The proposal for an Economics Division indicates that economics is recognized as being vital to the resource development of the country. According to the proposal,

the Fisheries Economics Department "... deals with studies on production, marketing, feasibility studies..." Little attention was given to macroeconomics in the economic structure proposed. The macroeconomic phases of fisheries have not been developed, but more attention should be given to those areas of the economy involving dynamic spillovers affecting the aggregate economy. Specific questions of concern are the multiplier effects of new investments in fisheries and the effects of new consumer expenditures in the economy on income and employment. Additional work is also needed in the areas of external economies and the opportunity cost of resources used in fisheries.

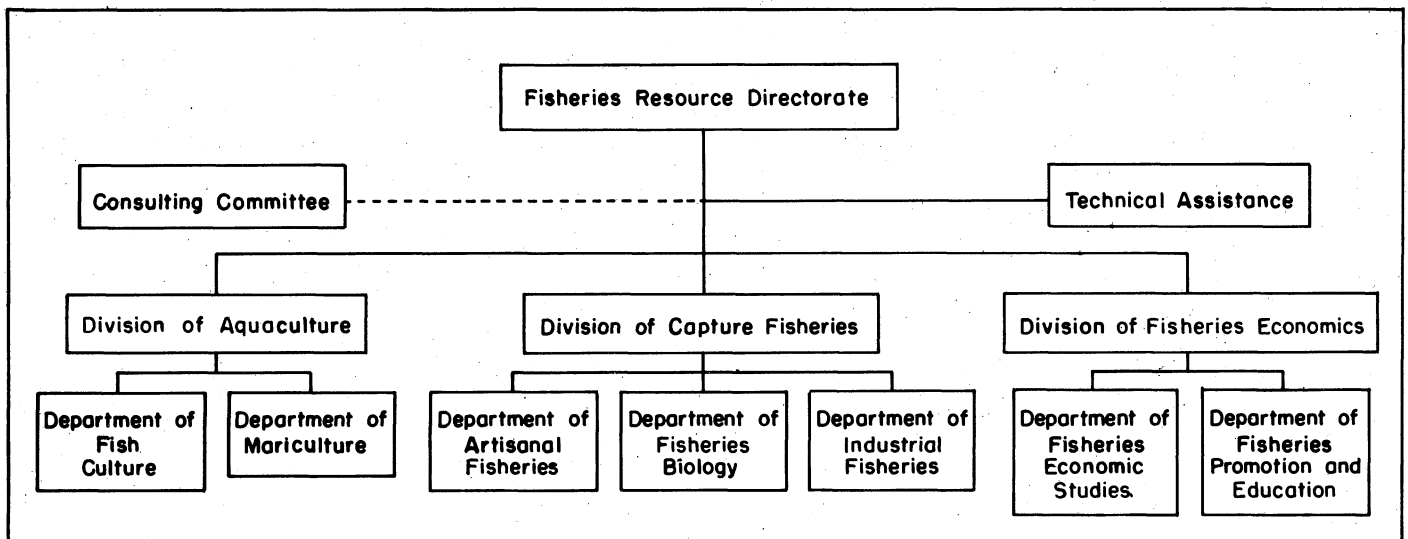
The Department of Fisheries Promotion and Development will aid in cooperative development and related education of artisanal fishermen as well as consumer education on fish for the consumer.

The Fisheries Resource Service has tentative plans for four new demonstration centers to be completed within the next 5 years. Three of the projects would be related to freshwater fisheries and the other would be concerned with marine fisheries. The installations would include demonstration ponds, buildings, offices, packaging and processing operations, fish drying machines, fish feed preparation equipment, and marketing study demonstrations. These centers would allow a complete demonstration synthesis from starting with fingerlings to getting the fish in the consumer's hand in good condition. Significant financial and technical assistance will be needed to bring the centers on line within a reasonable time period.

CIDA from Canada has made a contribution to the marine fisheries development in El Salvador as indicated above. In September 1977, two fisheries biologists with M.S. degrees were expected to begin work on research in Lake Olomega and Lake Ilopango. This type of aid should help stabilize the research efforts of the thinly staffed Fisheries Resource Service.

Extension Program in Farm Ponds

The extension program in fisheries is small at present. Progress has been made since 1972, however, when exten-



Proposed "directorate" reorganization of the Fisheries Resource Service in El Salvador.

sion work was not permitted to be carried out within fisheries. The Extension Service of the Fisheries Resource Service aids aquaculture through 11 technical assistants — 9 for communal ponds and 2 for private farm ponds. Seven persons give technical and social work assistance to inland lake cooperatives. Eleven workers also participate in technical and social work programs with the marine cooperatives. The program of technical assistance was started in 1976.

During the past 4 years, 866 people have attended conferences which were held by fisheries extension workers. About 250 personal contacts were made in the field each year for a total of 1,000 visits during the last 4 years. Twenty short courses of 15 days each have been held. The total attendance at these sessions was not recorded.

Fisheries extension personnel have participated in agricultural expositions at the National and Central American levels. Talks were given to various high school and farmer groups. Fishing equipment was exhibited and literature made available to persons attending exhibits. The Extension Service participated in five agricultural expositions in different parts of the country from January through July of 1977.

In the communal pond program, fish production was 250 kilograms per hectare per year in 1974 and 1975. In 1976 and to mid-1977 production had increased to around 615 kilograms per hectare per year. In 1974 and 1975 an average of 25 families participated in each communal pond program but the average fell to 20 in 1976. The average amount of fish available was 14.74 pounds per person per year. The Extension Service furnishes technical assistance in construction of ponds for fish culture and provides advice for the proper management of ponds.

According to fisheries research personnel, the Extension Service needs equipment in the form of mobile laboratories for water and soil analyses, equipment for measuring oxygen and temperature, chemical reagents, and engineering equipment.

Personnel needs include two civil engineers, one for each of the two zones of the country, and a topographer to identify proper pond sites and develop construction plans. Two more technical advisors trained in aquaculture and fisheries are also needed in the country. This appraisal of personnel needs seems modest in the author's view. It was admitted that the extension personnel need more training in construction and management of ponds.

Data obtained by extension personnel from pond owners include area of ponds, species of fish grown, production data, fertilizers applied, feed applied, mean size of fish, and sale price of fish. Some private construction companies exist for building ponds, but they need the direction of a fish culture technologist, according to Fisheries Research Service personnel.

At present the Extension Service shares 18 vehicles with the Fisheries Resource Service. In 1972 only eight vehicles were available. Complaints were expressed about unavailability of travel due to vehicles being in a poor state of repair. Purportedly spare parts and maintenance were problems.

Other organizations participating or cooperating with the Extension Service are the Institute of Agrarian Reform (ISTA), the Institute of Tourism, county governments, and the Ministry of Agriculture. Joint fisheries projects have been set up with Fisheries Resource Service and the BFA, ISTA, CENTA, and FOCCO. Under these programs, the

Fisheries Resource Service gets its funding from the cooperators. ISTA aids in technical assistance and provides assistance to farmers in getting credit from the BFA, the Federacion de Cajas de Credito, the Banco Agricola Comercial, and the Banco Hipotecario.

The Peace Corps

A substantial number of Peace Corps volunteers have participated in fisheries work in El Salvador. Several of these were interviewed to get a better overall picture of their participation. One member of the original team of four, Gary L. Jensen, is well into a Ph.D. program in fisheries at Auburn University. Another member of the original team, Robert Reynolds, works with fisheries for a private firm in El Salvador. Other workers from the Peace Corps who received degrees from Auburn are Ralph Parkman, M.S. degree, and David Dunseth, who received both M.S. and Ph.D. in fisheries. Additional volunteers with experience in El Salvador are David Bowman, Ken Johnson, Steve Hayes, Andres de George, Mike Shank, Jack Robinson, Mark Newman, Richard Ledgerwood, David Dorman, Jeff Hunter, David and Sharon Wytocck, Jon Cole, and Jeff Hoystradt.

In the present Peace Corps contingent, Steve Drew (B.S.), Francis Pearson (M.S.), John Leslie (B.S.), Martin Waltering (M.S.), and Anthony Grossman (B.S.) work with marine and brackish water fisheries. Their activities have dealt largely with technical assistance to cooperatives, research with crustaceans, and other biological work. Keith McBride (B.S.) was working on biological studies in the inland waters of the reservoir Cerron Grande and Peter Nevel (M.S.) was involved in research at the Santa Cruz Porrillo Experiment Station.

Several important studies and surveys were made by the Peace Corps volunteers with counterparts from the host country. The author had the opportunity to talk with two of the present volunteers and three of the previous ones. Opinions of their service varied. Some thought their services were well received and others felt that they were limited in work opportunities. It was reported that some of the volunteers sometimes sat around for several days with no assignment. Lack of planning and equipment were often blamed for troubles. The Fisheries Resource Service also reported that some of the volunteers adapted well to jobs and gave a good performance, while others did not. The over-anxious volunteers facing situations of equipment shortages might be expected to encounter morale problems in some instances. Travel seems to be a particularly difficult problem related to a shortage of vehicles and spare parts. Strong planning on critical paths in decisionmaking should be useful in increasing efficiency of the Fisheries Resource Service and its donors. The Peace Corps volunteers seemed to have a preference to work more directly with the people than was possible in the past.

FISHERIES PROGRAM APPRAISAL

A broad overview of the fisheries program and development in El Salvador notes both progress and problems. Certain acute problem areas, as envisioned by the author and others, are described, and certain recommendations for future fisheries policy are given.

General Impressions

The Fisheries Resource Service has made tremendous progress since 1971 when the Auburn University-AID project was set up. The tenfold increase in the budget in real terms by the Government of El Salvador from 1972 to 1977 is perhaps the best indicator of greater commitment and interest in fisheries. Experimental facilities have grown to the extent that benefits may be gained by a large portion of the people of El Salvador in the years ahead. New credit availability, new information through extension, and an expanded infrastructure in fisheries leading toward establishment of wider markets should afford the opportunity for significant expansion of this sector of the economy. Several significant problem areas still exist in the fisheries sector, however, and should be carefully considered in the future.

The Fisheries Resource Service has expanded until its manpower is spread thinly over the working area and sub-sectors. This fact is of extreme importance with respect to maintaining projects which require constant attention of trained personnel. Personnel turnover has been high in the past, purportedly due to a low salary structure in the Service.

In several instances, problems have arisen due to breakdowns by faulty transport equipment which severely limit the effectiveness of programs. Manpower skills are sometimes wasted in waiting on vehicles which do not come. Lack of spare parts is one of the reasons given for poor performance in this phase of the program.

The mean productivity of aquacultural fisheries seems to be extremely low at the communal ponds and low at the farm ponds. In contrast, the highest productivity was attained at one of the experimental communal ponds—more than 7,000 kilograms per hectare. The fact that the 70 communal ponds had a productivity of less than one-tenth this volume seems contradictory. At the farm ponds, mean production of 2,500 kilograms per hectare was reported. This is slightly more than one-third of the maximum produced under more or less ideal conditions.

Production of fish in private or communal ponds should not be expected to approach that obtained in an ideal experimental situation in which optimum stocking, feeding, fertilizing, and harvesting operations are practiced. The difference in production indicates a sizable technology and/or management gap, however.

Observations on the demand for fish are difficult to appraise, yet they seem encouraging. The private fisheries operations report an unlimited demand for high-quality fish, such as tilapia, in the fresh market. Income is a strong deterrent to demand growth among the rural poor, however. Latent demand for the product is manifest by the fact that some persons take sizable risks with dynamiting and other illegal means to obtain fish for consumption.

The provision of a large volume of high quality fish may have little effect on the very poor in some areas. Demand for fish is, no doubt, highly dependent upon income. In some parts of the rural areas the per capita income was around \$65 in 1974, according to resident economists. The large, high-quality fish are not likely to reach this group through normal market channels, although there may be a spillover of essentially the market rejects—the smaller fish—which this group can purchase.

Until a fisheries tradition is created and markets are firmly established in a country such as El Salvador, it is

difficult or impossible to establish the responsiveness to price changes and to other variables through elasticity measures. It is probably preferable to make comparisons with other countries going through a similar tradition change until a good data base can be created. Persons wanting to procure quick numbers may not realize that a time lapse of 20 to 30 years may be involved in the creation of new traditions involving customs, mores, and folkways. For this reason, one of the financial officials pointed out that an on-the-spot, benefit-cost analysis was worthless in the beginning of this tradition change.

If fish production could be greatly increased, the BID goal of reducing the price of fish by 30 percent could probably be attained. At the same time, volume could probably be increased greatly by bringing fish consumption to some families who were previously unreached. This result requires an extensive educational program, which is difficult to execute at the lower socioeconomic levels of the populace.

Persons who are highly trained in the scientific aspects of fisheries spend large proportions of their time on administrative duties. This leaves little time for contributions in their own field of endeavor. This situation seems to be true with Dr. Jose Cabrero, Lic. Mauricio Machon, and Lic. Cesar Abrego.

Inadequate numbers of trained personnel in the Fisheries Resource Service may be one reason for the poor productivity in private farm ponds and in communal ponds. This problem is also related to the small number of workers in fisheries. The short time period in which the Extension Service has been functioning should be kept in mind, however, when evaluating the effectiveness of the program.

Problem Areas

Aerial application of pesticides to cotton fields in the immediate area of the Santa Cruz Porrillo Fisheries Station is a continuing problem. It has resulted in mortality of fish in ponds. A no-spray zone of 500 meters from the Station exists, but a 1,000-meter band has been requested. Strong political forces in the agricultural sector have prevented passage of a law to give greater protection. The fisheries officials argue that the experiment station was in existence before the cotton enterprises arrived, giving them a prior claim to the land use. Severe pesticide problems apparently exist in other parts of the agricultural sector because of frequent and possibly overuse of cotton poisons. Breeding stock of certain fish species require 2 to 4 years to develop, and the risk of their loss must be considered in assessing benefits and costs.

One apparent problem exists in the form of a shortage of trained personnel in fisheries biology, economics, and other disciplines. Existing research facilities and structures—laboratory hardware, buildings, complementary equipment, and ponds and allied structures—are of excellent quality. Unfortunately, the service does not have complementary personnel trained to make the best use of these facilities, in the opinion of this author. A related matter which may be a significant problem is the increased involvement in administrative duties of personnel trained in the highly technical areas of fisheries, which may preclude the “highest and best use” of this form of human capital. A large part of Dr. Cabrero's time must, of necessity, be spent on administrative matters since he is the Director of

Renewable Natural Resources. This fact does not necessarily mean that his services are not more effective to the overall fisheries program than if he were working in biological or other technical aspects of the fisheries program. Similar concerns were felt with respect to Lic. Mauricio Machon and Lic. Cesar Abrego, both of whom have highly technical skills in fish biology and aquaculture, respectively. A large part of their time is spent on administrative matters not directly associated with fisheries sciences.

A related matter is the lack of trained personnel in technological phases of fisheries biology at the lower and middle levels. Persons from agricultural or other schools could be trained in 2-year programs or bachelor degree programs to partly fill this serious void. Personnel trained in this manner would probably be more likely to continue in the service and make a lasting contribution to fisheries development. Classes held at the Boys Home contiguous with the Izalco Experiment Station are a step in the right direction. Only a fraction of the boys (mostly 14 to 18 years of age) get to finish high school. If a group of these students was given special training in high school for specific service to the program, it would allow useful employment for a better resource use. Highly successful high school graduates from other parts of the country could be sent to 2-year, if not 4-year, colleges for special training in fisheries.

A slightly different type of problem exists in the form of a severe lack of trained extension personnel to take known technology packages directly to the people. At the time Dr. David Bayne of Auburn University was advisor to Fisheries in El Salvador, extension workers were not allowed to participate in fisheries development. Present participation seems inadequate.

The author is concerned about plans to build the four demonstration projects and the other expansions involved in the proposed Fisheries Resource Service "directorate" reorganization in view of the limited number of trained personnel available. The trained personnel are thinly spread in the present structure, leading to serious problems in project continuity due to employee turnover.

Although the fisheries law as described in Circular #03, dated August 29, 1967, from the Ministry of the Interior seems to make an adequate effort to protect the fisheries resources, enforcement is a serious problem at present as it has been in the past. Dynamiting, rotenone poisoning, illegal diversions to capture fish, and other illicit means of harvest are a serious problem in rivers and in certain other waters. There is a need to bring law enforcement to a level to complement other investments in the country's fisheries development. The law does not permit development of the brackish waters in coastal areas by private enterprise. These mangrove swamp-type areas are completely protected as natural areas.

Persons who have served in the Peace Corps in fisheries say their services are not being used to full capacity. All but two of the current volunteers are involved in non-freshwater fisheries and some said they were not allowed

to become properly involved in the work. None of the Peace Corps volunteers is directly involved in extension activities.

Recommendations

1. Intensification of training in fisheries development and management should be effected at the lower levels. This could be done by special classes at high schools, increased short-courses and intensive training of workers for periods of 3 to 5 months in fisheries technology, 2-year programs in fisheries at the Agricultural College, and 4-year programs at universities. The large majority of this training should be at the lower, "hands-on" level of the program. These developments should be designed to improve efficiencies at the operational and extension levels. A technology base can be developed only if properly trained individuals are available for managing and operating the system. Technology can be transferred to the user only if adequate extension and other educational programs are designed for that purpose. Every effort should be made to keep aquacultural and fisheries scientists as close as possible to the work for which they were trained. Use of personnel trained in fisheries for teaching purposes seems to be a valid allocation of resources.

2. Extensive economic studies should be made a part of all programs involved in fisheries development in El Salvador. Economic analyses have not been an integral part of studies commensurate with the technological developments. This recommendation is in line with policies recommended by various officials from the Latin American Bureau and Technical Assistance Bureau of AID, by personnel of the Inter-American Development Bank, by the Banco de Fomento Agropecuario, by the World Bank, by the U. S. Department of Commerce, and others.

3. Outside expertise should be sought in setting up the economics division under the new "directorate" organization which has been proposed. This plan should be designed to include micro- and macroeconomic analyses with the intent of optimizing in the allocation of the country's socioeconomic goals. The economics group should be so organized that its input is lent to project and policy changes before they are effected. All experimental work should be done under a framework which is amenable to the extraction of economic data effective for decisionmaking and policy analysis. Opportunity cost of the nation's scarce resources should be considered in all major project expenditures. Social costs and benefits should be considered in impact analyses to the extent of data limitations.

4. The USAID should seriously consider the possibility of providing additional assistance to the Government of El Salvador in various program areas including extension and economics. Training opportunities in academic and practical fisheries programs should also be provided for selected staff of the Fisheries Resource Service of the Ministry of Agriculture.

