

512-15-180-247.4 NE

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AGENCY FOR INTERNATIONAL DEVELOPMENT  
Washington, D.C. 20523

PD-AAB-673-A1

OFFICE OF THE AUDITOR GENERAL  
AREA AUDITOR GENERAL - LATIN AMERICA

AUDIT REPORT

USAID/BRAZIL

FISH PRODUCTION, PROCESSING AND MARKETING

PROJECT No. 512-15-180-247.4 NE

COPY No. 12

For the period June 15, 1964  
through November 30, 1972  
Audit Report No. 1-512-73-84  
February 26, 1973

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REPORT ON EXAMINATION  
OF  
FISH PRODUCTION, PROCESSING AND MARKETING  
PROJECT No. 512-15-180-247.4 NE  
FOR THE PERIOD  
JUNE 15, 1964 THROUGH NOVEMBER 30, 1972

SECTION I - SCOPE OF EXAMINATION

The Brazil Residency of the Area Auditor General, Latin America, has performed an interim examination of the subject project. This was the first examination of project activities and covered the period from June 15, 1964 through November 30, 1972. The audit work was performed on an intermittent basis from July through December 1972.

The primary purpose of the examination was to review and evaluate program planning and implementation as compared with project objectives and to determine the quality and effectiveness of financial and administrative management. Other purposes were to ascertain the degree of compliance with AID policies, regulations and procedures.

Our examination was made in accordance with generally accepted auditing standards and accordingly included such tests of financial records, inspections and discussions as we considered necessary in the circumstances.

Before issuance this report was reviewed with appropriate USAID/Brazil (USAID/B) officials and their comments were given due consideration.

## SECTION II - BACKGROUND INFORMATION

Northeast Brazil has been plagued by intermittent droughts mainly in its geographical zones away from the humid coastal area. As a result, the Region has experienced slow economic development; also, its population has subsisted on a marginal food regime which is particularly deficient in high quality protein such as fish so necessary for a reasonably good diet. As a means of countering the effects of the droughts, the Government of Brazil (GOB) has been constructing reservoirs in this area. The National Department of Works Against the Droughts (DNOCS) has been the responsible agency, and has developed an extensive system of approximately 850 reservoirs, both public and private, which vary in area and volume. Also, about 7,000 additional small reservoirs and ponds have been constructed by individuals without government assistance. Many of these reservoirs and ponds had been producing a fish crop which, however, was not contributing efficiently to the diet of the Region's population. Consequently, the GOB became interested in expanding the production of freshwater fish in Northeast reservoirs and ponds as a way of increasing the supply of available protein for the Region's population.

USAID/B involvement in this area initially began in 1962 when it sponsored a preliminary survey of fishery development needs by a fisheries management specialist from

the Bureau of Commercial Fisheries (BCF), U.S. Department of the Interior. This survey suggested a need for the exploration of certain areas in fisheries development. Following a formal request from the Superintendency for the Development of the Northeast (SUDENE) in 1964, these areas were studied in considerable detail by a BCF team of five fisheries specialists under an AID-Participating Agency Service Agreement (PASA). The results of this study formed the basis for the subject project which concentrates on freshwater fisheries development and resource management technical assistance.

Although project activities were initiated in February 1966 with the arrival of two full-time BCF PASA technicians, a project agreement was not signed until September 1, 1966. Parties to this agreement (CONTAP<sup>1/</sup> - NE-11) were USAID/B, SUDENE and DNOCS. The latter two agencies were designated as the cooperating agency and the implementing agency, respectively. The agreement served to obligate CONTAP funds<sup>2/</sup>, through SUDENE, to permit DNOCS to expand its fisheries technology, reservoir resource surveys and piranha<sup>3/</sup> eradication activities.

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<sup>1/</sup> Technical Cooperation Council of the Alliance for Progress, now Sub-office for International Economic and Technical Cooperation (SUBIN).

<sup>2/</sup> Now SUBIN funds. They represent GOB-owned local currency generated under Commodity Import Program Loans and interest generated under Payment Option Agreements.

<sup>3/</sup> A carnivorous, extremely voracious species of fish.

To attain these goals the following courses of action were to be taken:

- (a) Development of coordinated activities to improve utilization of freshwater fish; improvement of techniques for fish preservation; improvement or introduction of new skills and methods for fish harvesting; introduction of modern methods of reservoir fisheries management; fisheries biological research and piranha eradication.
- (b) To provide equipment for fisheries research, and to train technical and non-technical personnel and a team of reservoir management officials in statistics collection, fisheries processing technique and reservoir resources utilization.
- (c) To provide research concerning methods and practices of intensive fish culture applicable to reservoirs in Northeast Brazil and to initiate training to assure establishment of a new policy for fisheries production with a view toward commercial intensive culture.

Under the terms of the original and subsequent agreements, AID has provided technical services consisting of two full-time BCF PASA Fisheries specialists from project inception to June 1971; two full-time Auburn University fish culture specialists from November 1969 to the present<sup>1/</sup>; and six short-term consultants. In addition, AID has furnished laboratory and field research equipment and supplies, and also has provided funding for specialized training in the U.S. for selected participants.

Auburn University expertise was secured through an open-end AID/Washington contract, AID/csd-2270, under which the

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<sup>1/</sup> Both scheduled to terminate in June 1974.

following task orders (T.O.'s) have been established for  
Brazil:

T.O. No. 3 (as amended). Effective October 15, 1969, provided for the services of one fishery specialist for a 28-month period. In essence it was to provide (1) assistance to DNOCS, SUDENE and other qualified interested parties on intensive freshwater pond fish culture in Northeast Brazil, and (2) assistance to DNOCS in the field of fisheries research.

T.O. No. 4 (as amended). Effective August 25, 1970, provided for one additional fishery specialist for a 2-year period to give assistance and training in development of a long-range program of fishery research and fish population dynamics.

T.O. No. 8 - Effective March 25, 1972, provided for one fish culture specialist/research and one fish culture specialist/extension for a period of 24 months each. The objective of this T.O. is to assist in the development of practical systems of pond fish culture and the introduction of these systems in private ponds on farms in Northeast Brazil. An extension training program for DNOCS and state extension agents was made part of this T.O. This included planning and installation of

pilot fish culture systems on private farms as well as a participant training program for three Brazilians.

Project termination is scheduled for June 30, 1974.

As of June 30, 1972, project funding was as follows:

	<u>Dollar</u> \$	<u>Local Currency</u> Cr\$
AID Contribution	864,373.15	
GOB Contribution:		
Trust Fund <sup>1/</sup>		750,148.44
SUBIN <sup>1/</sup>		1,204,000.00
DNOCS		626,118.00

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<sup>1/</sup> Represents GOB-owned currency generated under Commodity Import Program Loans and interest generated under Payment Agreement Options

### SECTION III - SUMMARY OF EXAMINATION

Our examination disclosed that the program has realized significant progress in achieving the desired institutionalization of a fisheries department within the implementing agency, DNOCS. This progress has resulted in spite of delays caused by the lack of timeliness in the receipt of SUBIN local currency funds for supporting project costs. It would appear that the effects of such delays could be mitigated by the development of new procedures to ensure the timely availability of SUBIN funds. Previous Mission efforts to expedite the release of SUBIN funds have not been totally successful.

Fish hatchery and fish culture activities have existed separately within DNOCS, but with Mission encouragement this situation will be changed in the near future. A reorganization, awaiting approval of the Director General, will consolidate these activities under a Directory of Fisheries and Fish Culture responsible directly to the Director General.

Returned participants trained in the U.S. form a core of 14 Brazilian technicians who are actively engaged in the project or related activities. Laboratory and field research facilities have been installed and are functioning. These facilities are reputedly the largest of this type in South America.

In mid-1968 it was determined that the means of achieving the prime project goal had to be altered. Ecological and biological factors, decreasing yield and lower reservoir productivity resulted in a redesigning of the project. At this time, the project began to focus its efforts on intensive pond fish culture as an alternative to attain the ultimate goal of freshwater fish production. This latter phase of the project, although yet in the early stages, appears to have high potential.

We found, with regard to the quantitative measurement of fish production, that DNOCS had not placed sufficient emphasis on the task of gathering statistics to measure fish productivity in reservoirs. Whether or not this had a deleterious effect on the project is a moot question since current efforts are focused on pond culture. However, precautionary measures are suggested to facilitate accurate measurement of project progress under the revised plan of action.

Freshwater fish processing and marketing did not show any significant improvement as compared with the conditions existing at the time the project was launched. Unsanitary condition of fish crops, poor fish preservation, lack of cold storage facilities, and an archaic marketing system still prevail. An attempt to correct this situation by the establishment of a fishermen's cooperative at Araras

Reservoir was not successful. The fishermen apparently were not sufficiently motivated to change from established but less efficient methods of marketing. Improvement of fish preservation is now being pursued by means of two demonstration salting houses. Along with current efforts on intensive pond fish culture, a freshwater fish marketing survey is scheduled to be made in the State of Ceará to attempt to help the fishermen receive a better price for their product.

An occurrence of non-used equipment (4 outboard motors) was noted and corrective measures are recommended.

This report contains three recommendations.

SECTION IV - FINDINGS AND RECOMMENDATIONS

A. PROGRAM INSTITUTIONALIZATION AND RESEARCH ACTIVITIES

During the span of this project, a fundamental concern of the U.S. technicians has been the creation of an organized and coordinated fisheries research unit within DNOCS capable of insuring the continuity of the program subsequent to the termination of USAID/B assistance. In this context, success has been substantial but near total success is within reach subject to the approval of a reorganization plan by DNOCS.

Currently, the fish hatcheries unit (for stocking dams) and the fish culture unit are separate organizations within DNOCS. The lack of integration of these two units has been cause for Mission concern. However, we were informed that a plan for restructuring the part of DNOCS concerned with these activities is being considered by the Director General of DNOCS. Approval will consolidate all fishery technology activities under a Directory of Fisheries and Fish Culture at a level immediately subordinate to the Director General.

Fish culture research during the period November 1969 - October 1971 involved over 20 species of both native and exotic freshwater fish and shrimp. Various levels of fish culture have been evaluated. Also, natural production, organic and inorganic fertilization, and feeding experiments have been performed.

At the time of our examination, three Brazilian counterparts (former participant trainees) were directly engaged in

both intensive pond culture experiments and preliminary fish extension programs under the guidance of the two Auburn University specialists. Other participant trainees have displayed initiative and motivation in current activities generally related to project goals.

SUBIN funds and AID-financed commodities (fishery laboratory equipment and supplies) were used to build a research unit currently comprising a basic laboratory in Fortaleza and a major field research facility near Pentecoste Reservoir, about 80 kilometers west of Fortaleza. At this latter site, 52 ponds (out of 100 programmed) with a total surface area of about 4 hectares have been constructed since November 1968. Of the constructed ponds, 48 are already in operation and the intensive pond fish culture research is currently being carried out by an Auburn University specialist. These research facilities now stand as the largest of this type in South America.

A lack of timeliness in the release of cost supporting SUBIN funds, in spite of Mission efforts to expedite such, has been detrimental to the rate of project progress. For example, the first release of such funds did not occur until one year after the arrival of the U.S. technicians in February 1966. Since then, similar delays have existed in subsequent releases of funds. This subject is discussed further on page 15 of this report.

## B. FISH PRODUCTION

The ultimate purpose of this project is to expand the production of fish in Northeast reservoirs in order to increase the supply of high quality protein for the Region's population. While a lot of work has been done, no significant progress toward this end has been indicated. In fact, statistical data reflects a decline in the fish catch at selected reservoirs. However, our discussions with project team members and DNOCS officials evoked a consensus that DNOCS data collection is deficient due to an insufficient number of personnel, thus affecting the resulting statistics. Actually, an increase in production might be concealed by the inadequate data, although the 1970-1971 drought probably had a negative influence. Except for the principle of having accurate data for measurement of project progress, the questions raised may be moot since the team found it necessary to restructure the project.

The following factors suggested that a revised project strategy was necessary in mid-1968:

- (1) Biological factors: An excess of fish too small to have a market value, thus requiring the introduction of new species capable of feeding on this excess.
- (2) Decline of productivity: Studies disclosed that a reservoir is more productive during its early life with the result that fishermen move on to new ones which provide better crops.

- (3) Maximum yield: Surveys revealed that reservoirs in Northeast Brazil have reached, or in some cases exceeded, their maximum sustainable yield.

The revised project gives consideration to the above factors and attempts to increase fish production by rearing fish in enclosures in existing reservoirs and intensive pond culture. These appear to be valid alternatives. The successful development of pond fish culture in Central East Africa, as reported by the United Nations' Food and Agriculture Organization (FAO), constitutes an encouraging factor.

According to FAO's experience, the development of pond fish culture requires three basic stages: (1) a set of fish pond units for demonstration purposes, (2) the use of these demonstration units for field days or courses of instruction for the people of the region, and (3) extension services through a trained staff to advise and assist farmers on the spot.

We found that in its new phase the project has been planned along the above mentioned model. Achievements thus far are summarized as follows:

- (1) An intensive pond fish culture station has already been established at a site near the Pentecoste Reservoir (see page 12).

- (2) Two small reservoirs near Fortaleza are being used to raise fish for local consumption and to gather additional information for the development of management techniques applicable to other similar bodies of water.
- (3) Plans are ready to implement an intensive pond fish culture program among farmers who own land bordering the irrigation canals at reservoirs. At the DNOCS pilot irrigation project of Morada Nova, south of Fortaleza, 3 to 5 farmers will be initially selected with the possibility of reaching a total of 150 farmers settled at this project site.

Implementation of this segment of the project will be largely dependent upon the receipt of additional SUBIN funds to support project costs which will include construction of the farm ponds at the irrigation project. We were informed that an agreement for the obligation of funds needed was ready to be signed between SUDENE and SUBIN, but according to past experience (see page 12), at least several months will elapse from date of the agreement before the funds are released. This could result in an undue slow-down of this activity which at this time might be crucial to project progress as a whole. Since SUBIN funds have been consistently slow in being released to the project,

it would appear that the time-table of the work plans could anticipate this delay and avoid any negative consequences.

Recommendation No. 1

That the Mission in conjunction with SUDENE and DNOCS, develop procedures to ensure the timely availability of SUBIN funds for the project.

We view the probable deficiency of fish harvest data as potentially serious. Without accurate measurement of production, how will the Mission know if the quantitative goals established are being met? In this regard, we feel it is important that the statistical data requirements be identified and the means for their accumulation be determined so that they may be compared with the benchmarks of the project agreement.

Recommendation No. 2

That the Mission, in collaboration with SUDENE and DNOCS, review and strengthen the system of data collection to ensure the development of statistics necessary to provide for the reliable measurement of project progress.

### C. FISH PROCESSING AND MARKETING

In Northeast Brazil, freshwater fish commands a much lower price (less than half) as compared with saltwater fish. The price obtained by the reservoir fishermen ranges between one-third to one-half of this low market price, or about Cr\$1.00 per kilo (\$0.08 per lb). Most of their catch is sold to middle-men who take the fish to markets. Unsanitary handling of fish contributes to the uneconomic market conditions. Usually fish caught are not eviscerated. If not sold before they begin to bloat, they are then salted and sundried.

The problems of freshwater fish processing and marketing in Northeast Brazil were first pointed out in a study performed by a U.S. consultant in marketing in mid-1967. He presented a set of six recommendations which included the need for (1) a freshwater fish marketing survey, (2) improved sanitary fish processing procedures and marketing system, and (3) a 6-month participant training program in the U.S. on fish marketing.<sup>1/</sup>

Due to lack of a system of cold storage, salting is the most popular means of fish preservation. In an attempt to improve salting and drying methods, the project team has

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<sup>1/</sup> Two DNOCS employees have received a 10-month non-degree course in the U.S. on fish processing and marketing. One has left DNOCS and became a faculty member of the Federal University of Ceará. The other is still associated with the project.

designed and installed at two reservoirs (Pentecoste and Araras) screened salting houses to serve as demonstration sites. A two-man team (former participant trainees) is devoted to this experiment.

Improvement in the marketing system has been negligible. Jointly sponsored by SUDENE and DNOCS, a fisherman cooperative was established at Araras Reservoir. Its facilities include motor boats, refrigerated trucks and frozen storage space. However, the response of fishermen was disappointing. Out of an estimated total of 2,000 fishermen, only 160 became members of the cooperative, and no more than 20 percent of those members use the cooperative for marketing their catch. Apparently, illiteracy and poverty create in most fishermen a state of dependence on the middle-man, usually a local merchant, who frequently gives them money and foodstuff in advance for their catch. The operational features of the cooperative apparently did not provide sufficient motivation for the fishermen to depart from long established, but inefficient, marketing procedures.

We did note, however, that the U.S. fish culture specialist/extension has included in his work plan schedule through March 1973 a freshwater fish marketing survey in the State of Ceará as part of an effort to help the pond fish farmer receive the best possible price for his product.

D. COMMODITIES

As of June 30, 1972, AID-financed commodities totaling \$44,628 have been provided to the project. Principally, these were laboratory and field research equipment and supplies. Most of the items were delivered to DNOCS. A few were delivered to the Superintendency for Fisheries Development in Recife during the earliest phase of the project for use in their Fishery School.

On a selective basis, we made an end-use observation of non-expendable items delivered to DNOCS and noted the following exceptions:

- (1) An inventory of AID-financed commodities was not available.
- (2) Stock record cards were not found for most of the items.
- (3) Four out of seven 40 HP "Johnson" outboard motors procured for this project were found idle at the project warehouse. Two of these were still in their original packages.

Recommendation No. 3

That the USAID/B Agricultural and Rural

Development Office (ARDO) request DNOCS to:

- (a) prepare and submit to USAID/B a complete inventory of all AID-financed non-expendable items procured for the project;
- (b) complete

Recommendation No. 3 (Continued)

stock record cards for such items; and (c) submit to USAID/B specific plans, subject to Mission approval, for the use of the four outboard motors found idle at the project warehouse. Otherwise, recourse for the unused items should be established by USAID/B under Standard Provision H of the project agreement.

E. PARTICIPANT TRAINING

As of November 30, 1972, the following numbers of participants had completed non-degree training in the U.S.:

Short-term:

SUDENE and Federal University of Ceara <sup>1/</sup> employees	<u>12</u>	
DNOCS employees	<u>11</u>	23

Long-term:

DNOCS employees		<u>5</u>
Total		<u>28</u> =====

Of the 16 DNOCS employees who have received training in the U.S., all but two are still working for that agency either directly associated with the project or in related activities. Information available indicated that 2 of the 12 participants from SUDENE and the Federal University of Ceara have taken jobs in the private fishing industry in the Northeast.

Two DNOCS employees were scheduled to depart in January 1973 for 2-year M.S. degree level training in the U.S.

Selection of the candidates for this training has moved slowly because of a feeling among potential candidates that AID per diem in the U.S. is provided at a level inconsistent with the needs of a student that is accompanied by his

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<sup>1/</sup> The project agreement required that DNOCS promote an institution(s) of higher learning to provide the highly trained and skilled manpower needed for a freshwater fish industry in Northeast Brazil.

dependents. For example, the candidate selected for the FY 1971 scholarship (the Brazilian Executor for the project) decided not to take advantage of this training for that reason. However, this problem now appears to be overcome.

EXHIBIT A

## Fish Production, Processing and Marketing

Project Agreement No. 512-15-180-247.4 NE

Source and Application of Funds as of June 30, 1972

	U.S. Contribution (Dollars)	GOB Contribution (Cruzeiros)		
		Trust Fund	SUBIN	DNOCS
<u>TOTAL CONTRIBUTION</u>	864,373 =====	750,148 =====	1,204,000 =====	626,118 =====
<u>FUNDS APPLIED</u>				
<u>Personnel</u>				
Direct A.I.D.	124,402	290,809	-	-
PASA	380,548	222,473	-	-
Contract	146,145	54,929	-	-
<u>Participants</u>				
Direct A.I.D.	51,324	23,465	-	-
Contract	-	17,400	-	-
<u>Commodities</u>				
Direct A.I.D.	42,128	-	-	-
PASA	2,000	-	-	-
Contract	500	-	-	-
<u>Other Costs</u>				
Direct A.I.D.	15,000	14,280	-	-
PASA	-	14,883	-	-
Contract	3,000	-	-	-
<u>Project Support</u>	-	-	1,204,000	626,118
<u>TOTAL EXPENDITURES</u>	765,047	638,239	1,204,000	626,118
<u>UNCOMMITTED BALANCE</u>	99,326	111,909	-	-
<u>TOTAL</u>	864,373 =====	750,148 =====	1,204,000 =====	626,118 =====

EXHIBIT B

DISTRIBUTION OF  
AUDIT REPORT  
No. 1-512-73-84

	<u>COPY No.</u>
Mr. William A. Ellis, Director, United States Agency for International Development Mission to Brazil	1 - 10
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AID/W - Office of Audit (AG/AUD)	15 - 18
AID/W - Office of Program Operations (IA/OPNS)	19 - 20
USAID/Panama - Inspector-in-Charge, Inspections and Investigations Staff/Panama (IIS)	21
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NOTE: All audit work papers are attached to COPY No. 23 which is on file in the Brazil Audit Residency Office, AAG/IA.