DJIBOUTI FISHERIES DEVELOPMENT PROJECT

A.I.D. EVALUATION WORKING PAPER NO. 110

by

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FOREWORD

This report is one of a series of Center for Development Information and Evaluation (CDIE) special studies analyzing the Agency for International Development's (A.I.D) experience in technology transfer. Whereas most previous CDIE evaluations emphasized the impact of projects on intended beneficiaries, the technology transfer series focuses on development interventions that are already known to have had significant effects on decision-making and behavior. Rather than focusing on beneficiary impact, the studies examin how A.I.D could improve the marketing of new technologies and increase the adoption of new products by end users.

This report examines a multidonor effort to increase fish production and consumption in Djibouti. In addition to improvements in fishing technology, the project included major components intended to improve the handling, storage, and marketing of fish; to strengthen institutional capacities for fisheries management; to promote private sector initiatives in the fishing industry; and to stimulate demand for fish products.

Although the interplay among project components was complicated and some aspects of the project proved more successful than others, the project experience clearly demonstrated the importance of marketing techniques and concepts in the technology transfer process. This report reflects information available at the time of the evaluation in 1985, although the project continued to receive A.I.D. funding after that time.

Understanding the technologies needed to ensure the widespread adoption and diffusion of new food, health, and family planning products is just as important as understanding the technologies needed to produce these new products. The technology transfer series is expected to provide a better understanding of how marketing technologies can be applied in improved technology transfer projects, programs, and policies for the future. A planned synthesis of findings from all of the technology transfer studies will examine crosscutting issues and assess the implications of different marketing approaches and concepts for different kinds of products in different country settings.

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SUMMARY

The Djibouti Fisheries Development project is a collaborative multidonor effort that began in 1978 with the arrival in Djibouti of a fisheries adviser from the French bilateral assistance agency, Fonds d'Aide et Cooperation (FAC). Since that time the U.S. Agency for International Development (A.I.D.), the International Fund for Agricultural Development, Catholic Relief Services, and the Food and Agriculture Organization have joined FAC and the Government of Djibouti on this project. The project has aimed to increase national fish production through artisanal means and increase the fish consumption of Djiboutians. The project is approaching this goal by strengthening the institutional capacity of the Ministry of Agriculture's Livestock and Fisheries Service to support private sector initiatives in the fishing industry and to encourage the development of the Cooperative Association for Maritime Fishing (ACPM). Through these institutions, the project is helping to improve the system for harvesting, handling, storing, and marketing fish on a national scale.

To reach its goals, the project is introducing technologies at several levels in the fishing industry. In terms of

technology to improve fish production, the project has successfully introduced C-flex fiberglass hull sheathing. The project has more demand than it can fill for boat repair using this technology. Fishermen have also adopted the use of the outboard motors sold by ACPM. Price and financing terms have been as important to fisherman's adoption of this technology as has the appropriateness of the technology to the locale. Fishermen are taking ice out to sea with them to preserve the freshness of their catch. However, they have not adopted the nets, hooks, safety equipment, and traps the project has made available.

In addition, ACPM is operating the fish processing plant with the help of the technologies recommended by the project. Elements of the private sector fishing industry have also adopted some of these technologies, such as gutting fish as a first stage in handling, maintaining a cold chain fairly well, and fileting, freezing, and storing fish in large refrigerated units.

The training component of the project has been very weak, which means that the project has not been successful in promoting diffusion of its technological package through a

systematic dissemination strategy. Dissemination of knowledge of fish production and fish processing and marketing has been by word of mouth rather than by means of a planned effort.

The most striking impact of the Fisheries Development project is the effect it has had on the fisheries sector beyond the cooperative. The successful impact on the private sector has been the result of two factors: (1) the social marketing program carried out by Catholic Relief Services, which has resulted in a rapid increase in demand for fish and the Government of Djibouti's policy of fixing ACPM producer prices at a level lower than market prices, which has encouraged fishermen to market through private channels.

Four groups have played important intermediary roles in the technology transfer process:

1. The technical assistance teams sent by the paricipating donors have been the knowledge brokers who identified the appropriate technologies for the Fisheries Development Project.

2. The Livestock and Fisheries Service and the ACPM have generally served as the organizational change-agent, following up on the leadership of the chief of the Livestock and Fisheries Service, who has been acting as the technology champion and gatekeeper for the project.

3. The donors and the Government of Djibouti have acted as macroinstitutional intermediaries, setting policy and providing the financing and legal framework for the project.

4. The private sector has played an important role as entrepreneur and trader, producing, processing, and selling fish in a system parallel to the official channel.

The Fisheries Development project provides several lessons regarding the process of technology transfer. The central insight is that technology transfer must extend to all sectors of the industry targeted for development. Thus, project planners must design a system that is both horizontally and vertically integrated.

In terms of horizontal integration, the shortcoming of this project is to have its failure taken proper account of private sector activity in the fishing industry. Although the project has focused almost all of its attention on building the fishing cooperative, ACPM, it is the private sector that has undergone far greater expansion in product handling and marketing.

However, the project has done much better in terms of vertical integration. It has addressed functions at every level of the fishing industry and has introduced technological improvements in production, processing, and marketing. Moreover, it has implemented a social marketing program to expand market demand in order to keep pace with increased production. The one weakness of the project's vertical integration of the industry has been the lack of a training program to circulate new information and receive feed-back on participants' use of the various technologies.

The final issues in evaluating this project is to determine the appropriate institutional arrangements and mandates for those institutions involved in the implementation of project components. First, management is a major weakness of the cooperative, the Livestock and Fisheries Service has given ACPM too broad a charter. Public institutions should restrict their

role to that of gatekeeper/technology champion and financial intermediary. Because it should withdraw, as much as possible, from involvement in production, processing, and marketing. ACPM has neither the management nor the financial capacity to handle the day-to-day operaton of these functions. Second, the social marketing program, which is being successfully implemented and managed by Catholic Relief Services, should be continued.

PROJECT DATA SHEET

1. Country: Djibouti

2. Project Titles: Fisheries Development

3. Project Number: 603-0003

4. Project Implementation: Phase I 1980-1984

5. Project Funding:

a.	Agency for International Development	$1,978,000
b.	Fonds d'Aide et Cooperation	235,000
c.	International Fund for Agricultural Development	1,220,000
		780,000
d.	Catholic Relief Services (from A.I.D.)	116,000
e.	Catholic Relief Services (from UNICEF)	106,000
f.	Government of Djibouti	797,000
	Total	$5,232,000

6. Purpose: To strengthen the institutional capacity of the Ministry of Agriculture's Livestock and Fisheries Service to support private sector initiatives in the fishing industry and to encourage the development of the Association Cooperative de Peche Maritime, thereby improving the system for harvesting, handling, storing, and marketing fish in Djibouti.

GLOSSARY

ACPM	-	Cooperative Association for Maritime Fishing (Association Cooperative de Peches Maritimes)
A.I.D.	-	Agency for International Development
CRS	-	Catholic Relief Services
FAC	-	Fonds d'Aide et Cooperation, French bilateral assistance agency
FAO	-	Food and Agriculture Organization
FD	-	Djiboutian francs (FD 177 = $1.00)
IFAD	-	International Fund for Agricultural Development
REDSO/ESA	-	Regional Economic Development Services Office, East and Southern Africa
UNDP	-	United Nations Development Program
UNICEF	-	United Nations Children's Fund

1. PROJECT SETTING

The Republic of Djibouti covers about 8,400 square miles commanding the mouth of the Red Sea. Its climate is hot and arid with an average of 5 inches of rainfall per year. The country is mainly sand and stone desert, with a few salt lakes and few natural resources. About 60 percent of its approximately 350,000 people live in the capital, Djibouti.

Djibouti gained its independence from France on June 27, 1977. It was known as the Territory of the Afars and the Issas from 1967 to independence. Djibouti's population is composed of the Afars, who make up about 30 percent of the population; the Issas and related ethnic Somalis, who make up about 50 percent, and Ethiopian refugees, who make up about 10 percent. The remainder of the population consists mainly of people of European or Arab origin.

Activities generated by the port and the railroads linking Addis Ababa with the Red Sea dominate the economy of the country. The service sector accounts for approximately 80 percent of gross domestic product (GDP). About 95 percent of Djibouti's food is imported, including all of its food grains and most of its animal protein.

Only 6,000 hectares or 0.26 percent, of Djibouti's land is arable, and agricultural entrepreneurs are gradually putting this land into market gardening. Livestock is the most important food-production subsector of the agricultural sector and is the main economic activity for a quarter of the national population. A 1981 animal census counted 100,000 cattle, 500,000 goats, 400,000 sheep, and 100,000 camels. Recent droughts, however, may have seriously reduced these numbers.

Artisanal fishing, which began in Djibouti less than 200 years ago, is the third most important food-production subsector. In 1978, when Djibouti began the Fisheries Development project, the fishing industry included 250 to 300 artisanal fishermen, a dozen fish retailers, and 50 small businesses in the service sector. There were also a number of Yemeni and Somali fishermen working Djibouti waters to supply their home markets. Annual fish consumption in Djibouti was estimated at 240 metric tons.

The city of Djibouti accounted for the bulk of the fish catch and national fish consumption. Fish was marketed in one of eight stalls in the central market or in baskets outside the stalls or outside the market itself.

Only fresh fish were brought to the market. Frozen fish was unknown except in the supermarkets. Fishermen and retailers used little or no ice to preserve or store fish during handling.

Reports estimate the potential annual yield of Djiboutian fisheries at about 2,000 tons demersal fish and 3,000 tons pelagic fish.

2. DESCRIPTION AND EVOLUTION OF THE PROJECT

The goal of the Fisheries Development project is to improve the nutritional status of the poor majority of the Djibouti population by stimulating an increase in the production and consumption of fish. The purpose of the project is to help improve the system for harvesting, handling, storing, and marketing fish based on a mix of public and private sector activities. The project was to achieve this purpose largely by strengthening the institutional capacity of the Ministry of Agriculture's Livestock and Fisheries Service to support private sector initiatives in the fishing industry and to encourage the development of the Cooperative Association for Maritime Fishing (ACPM).

2.1 Background

Donor interest in providing development assistance to Djibouti began with the country's independence in 1977. Because

of Djibouti's strategic position at the mouth of the Red Sea, the U.S. Department of State wanted a visible U.S. presence in the country as quickly as possible. In 1977, the Agency for International Development (A.I.D.) carried out a water and soils analysis in the interior of the country with the aim of developing Djibouti's market gardening. A.I.D. concluded from the study that fishing was the only resource that the country could exploit at a reasonable cost. The Government of Djibouti agreed with this conclusion.

The president of Djibouti made the first critical decision for fisheries development. Despite an offer from Iraq to develop an industrial fishing operation, the President chose the artisanal option. For political reasons, he wanted to target fishermen living in Obock and Tadjoura, to the north of the Gulf of Tadjoura, as the primary beneficiaries of the project. This region is the most economically disadvantaged part of the country and is inhabited by a people of different ethnic background than those from the more well-to-do south. Directing activities toward the poorest segment of the population was, of course, consistent with A.I.D.'s mandate as well.

2.2 Key Players in the Evolution of the Project

2.2.1 Livestock and Fisheries Service

The Ministry of Agriculture's SEP is the Government bureau responsible for implementing the Fisheries Development project. The chief of SEP has been the final arbitor of all policy and strategy questions. His influence derived not from his technical mastery of fisheries questions, but from his position in the administration, which enabled him to serve as a bureaucratic entrepreneur, screening technological choices to ensure that his choices were adopted.

Although the lines of decision-making within the project converged increasingly on the chief of SEP, his decisions were not made in a vacuum. He sought the consensus of a technical advisory team and frequently awaited the results of a technology demonstration before making a final decision.

The SEP chief has acted as a gatekeeper, identifying technologies appropriate to the project. For example, he has promoted the transfer of certain technologies, such as fiberglass hull sheathing and fiberglass boat construction and has opposed others such as oyster cultivation (although he

eventually relented on this issue). He has not only helped to increase the effectiveness of the technology transfer, but has also an advocate in the extension process.

2.2.2 Fonds d'Aide et Cooperation

In 1978 the Fonds d'Aide et Cooperation (FAC), the French bilateral assistance organization, provided SEP with a technical adviser in veterinary science. FAC later provided ACPM with a fisheries adviser who had been working in Djibouti as a fisherman for the previous decade. This adviser has played a particularly aggressive role in the evolution of the Fisheries Development project, but he will not be with the project during Phase II.

At the early stage of FAC assistance there was no formal project as such. The FAC fisheries adviser and the chief of SEP were simply fleshing out the technological implications of implementing a fisheries project that had a determined artisanal bias. The fisheries adviser had the knowledge and experience that the chief of SEP lacked. The adviser also had the personality and in-country experience to champion technologies to expand local employment yet husband fisheries resources for long term exploitation. The objective was the gradual

development of the fisheries subsector. For example, they concluded that a 9-meter boat with an in-board diesel engine equipped with winches and ice chests, would be more suitable than longer boats, which would require larger crews and create might social problems.

2.2.3 Food and Agriculture Organization

In 1980, the Food and Agriculture Organization (FAO) began supporting SEP under the umbrella of its Red Sea Regional project, financed by the U.N. Development program (UNDP). The role of FAO has been to expand the knowledge base regarding Djibouti fisheries resources. FAO has provided SEP with a statistician and has carried out a number of technical assistance missions for the project on a quarterly basis, FAO has sent staff members from the Red Sea Regional project on supervisory missions to Djibouti. However, the Red Sea Regional project expired in 1985, and there was to be no follow-on to the project.

2.2.4 Agency for International Development

In 1978, A.I.D. carried out a feasibility study on the development of Djibouti's fisheries industry. The study was based on the conclusions of A.I.D.'s 1977 analysis of Djibouti's water and soil. Under pressure to expedite project implementation, A.I.D. sent a consultant to Djibouti in 1979 to identify the appropriate equipment for the project technical package. Through a series of interviews with fishermen in Obock and Tadjoura the consultant developed the equipment list. Although he had problems communicating with the target group and designing and executing the survey, a technology package was ready when the A.I.D. project team arrived in Djibouti.

Implementation of A.I.D.'s Djibouti Fisheries Development project began in March 1980 with the arrival of the chief of party of the team from Resources Development Associates, the A.I.D.-secured contractor.

The project team contracted with a master fisherman for a series of short term consultancies. The fisherman expected to have a 40-foot vessel in service on which he could conduct experiments and demonstrations to train fishermen in various fishing techniques. However, procurement of this vessel was slow; a smaller Yamaha vessel arrived in 1981. Once this vessel

was outfitted to meet his needs, the fisherman experimented with different fishing techniques. However, the Yamaha was too small to handle group demonstrations and too light to handle such techniques as trap fishing. As a result, the fisherman turned to establishing a boat yard to test for a cost-effective technology to repair traditional fishing boats, an activity that had been of interest to A.I.D. at an earlier date.

The project team studied the boat-repair technologies on the market and decided on C-flex fiberglass hull sheathing, which was the easiest technology to use and to teach. The technical assistance team acted, in effect, as knowledge brokers to introduce a technology appropriate to the local situation. The FAC fisheries adviser had had previous experience with the system. However, the SEP chief was unacquainted with the technology, but on the strength of the endorsement by A.I.D. and the FAC adviser he agreed to initiate trials.

The first boat repair yard was in a warehouse in the SEP/ACPM compound. In the beginning, the project team had to comb the beach for abandoned boats. Fishermen were welcome in the repair yard and participated in demonstrations of the repaired boats. Soon, the boat yard was unable to keep up with the fishermen's work orders.

Another short-term consultant to the project team, the senior fisheries adviser, promoted oyster cultivation to help save and perhaps earn foreign exchange. The SEP chief resisted the promotion of this effort for a long time because these macroeconomic objectives seemed unrelated to the artisanal orientation of the project. Eventually, however, he relented.

In mid-1981, SEP requested an amendment to its project with A.I.D. In order to fund two new components to the project--the boat repair yard and the oyster cultivation experiment. The amendment also added funds to give the project flexibility in coordinating with the International Fund for Agricultural Development (IFAD) fisheries project, which was only then coming on line. The amendment brought the project funding up to $980,000 and extended the project completion date for 18 months, until August 1983.

The project was originally approved for 2 years with a life-of-project funding of $498,000. The money was to go for a full-time chief of party plus some short-term technical assistance. The project was to activate the ACPM, establish fish production and processing procedures, and identify additional interventions to enhance the productivity of Djibouti's fishing industry, particularly recognizing the dependence of successful marketing on the cold-chain system.

2.2.5 Cooperative Association for Maritime Fishing

At the start of the A.I.D. Djibouti Fisheries Development project, ACPM was a moribund group of fishermen who had formed this association years before. The project, however, intended to use the cooperative to diffuse the selected technologies. After the appropriate technologies had been identified, the project would work with the cooperative on extension activities, to demonstrate the technologies to fishermen. The technologies would be made available to fishermen and others involved in the industry through the cooperative's revolving credit program. Actual dish production and marketing would remain private sector activities outside the scope of the cooperative.

The main fish processing plant and wholesale/retail marketing outlet in the city was owned by the Government and operated by the fish processing plant and the outlet is located in the compound that houses SEP and ACPM headquarters on the outskirts of the city. The merchant, through his social and political associations, had access to the cold stores, freezers, and ice machines that the project was developing at the site. The chief of SEP and his advisery panel--then comprising the ACPM director, the FAC fisheries adviser, and the A.I.D. project chief of party--agreed that the cooperative should take over the operation of the fish processing plant when a planned chain of fish retailing kiosks in the city became operational.

ACPM became a legally constituted cooperative under Djiboutian law on June 14, 1980. The Government then began to support the cooperative with its own resources. Under SEP oversight, ACPM became the instrument for implementing the Fisheries Development project. The SEP/ACPM axis has been crucial to the evolution of the project which has further benefited from the long tenure of the leaders of these organizations. The chief of SEP and the director of ACPM have been in their positions since the inception of the project.

When the merchant who operated the fish marketing outlet died in January, 1981, SEP had to select a successor. The competing parties were ACPM, the heirs of the first merchant, and a competing merchant. ACPM was chosen to take over the processing and marketing activities, even though the supporting retail infrastructure was not yet in place. ACPM took over the plant in March 1981.

2.2.6 Catholic Relief Services

Catholic Relief Services (CRS) has played the lead role in social marketing activities related to fish usage in Djibouti. CRS efforts have taken place on two levels: field activities and social marketing.

CRS has had primary responsibility for food distribution in two refugee camps, Hol-Hol and Ali Adde. With funding from UNICEF, CRS bought fish from ACPM to provide refugees with their main source of animal protein. The refugees have adapted fairly well to eating fish.

With funding from Oxfam, CRS has also experimented with fish drying. However, because demand for fresh fish has exceeded supply, CRS has found that preservation technologies are inappropriate to the Djibouti context. Moreover, freezing fish is too costly for the mass market. CRS has also experimented with making fertilizer from fish refuse but has found that the level of demand for the product can not support the plant economically.

During 1982-1983, CRS set up fish retail outlets in Arta, Wea, and Dikhil under A.I.D. operating program grant funding. It installed refrigerated equipment and started the concessionnaires off with a free stock of fish. However, because CRS was later unable to resupply the outlets, they disappeared. (A.I.D. operating program grant funding has also gone into constructing and outfitting the boat repair yard at ACPM headquarters.)

The most successful CRS field program has been the UNICEF-funded nutrition education programs at the Mother/Child

Centers and the girls' social centers. The program at these centers emphasizes the nutritional benefit of fish and fish preparation. CRS visits two to three Mother/Child Centers per week, bringing about 10 kilograms of fish on each visit.

CRS field programs account for about a third of all ACPM fish sales. However, CRS has not been pleased with ACPM prices, which are often above open market prices.

The Government has also played an important role in supporting and coordinating the CRS social marketing program. In 1981, the Ministry of Agriculture began its support by focusing World Food Day activities on promotion of fish consumption. The Minister recruited the President for a spot on the nightly televised news and organized a blitz of radio spots. This promotional program has continued every year since then.

CRS efforts have also included the production of radio spots for the Ministry of Agriculture. Moreover, CRS has developed a fish promotion logo that appears on posters all over the city and it is now selling T-shirts bearing the logo. Alkso, CRS has produced a pamphlet for its fish nutrition programs at the Mother/Child Centers and the girls' social centers. CRS has distributed fish for World Food Day to orphanages and other such institutions. However, because CRS

has expended all its funds, it withdrew from the project on June 30, 1985. Its withdrawal meant the disappearance of ACPM's main institutional client and calls into question the continuity of the social marketing support for the project.

2.2.7 International Fund for Agricultural Development

The International Fund for Agricultural Development (IFAD) began implementation of Phase I of its pilot project in December 1981, behind schedule. The project lasted 3 years at a cost of $2 million. IFAD provided technical assistance and a trawler and financed construction of nine fish marketing kiosks.

Because of the size of IFAD funding, some change in the artisanal orientation of no Fisheries Development project was required if the project was to be able to absorb IFAD funds. A.I.D. tried to parry the challenge of the IFAD component by commissioning a marketing study profiling Djiboutian producers and consumers of fish products. A.I.D. maintained the Government of Djibouti and other donors neede the study before the IFAD components culd be implemented. IFAD, however, began construction of the kiosks before the study was completed. As a result, several of the kiosks were poorly located.

2.3 Evolution of the Project

A.I.D.'s Regional Economic Development Services Office for Eastern and Southern Africa (REDSO/ESA) did a mid-term evaluation of the Fisheries Development project in December 1981. The evaluation found significant progress in a number of areas. For example, fish sales through the fish processing plant had gone from 165 tons in 1979 to 297 tons in 1981. However, REDSO/ESA recommended that the project refocus its efforts on developing the cooperative's ability to manage its own operations and, in particular, to manage its own financial affairs.

A.I.D. implemented REDSO's recommendation through a second project amendment, which added another $1 million to project funding and extended the project until August 31, 1984. Under the amendment, a full-time financial manager and a master fisherman were added to the project team.

A.I.D. also has funded Phase II of the Fisheries Development project, 3-year $2 million project. The new project is consistent with the emerging orientation toward building up SEP and ACPM as institutions capable of realizing project goals. Phase II offers long-term technical assistance in the areas of policy and program formulation, marine biology

research, financial and operations management, marketing, fisherman training, and equipment testing. The projected benefits of Phase II include a 25-percent growth in the size of the fishing fleet, a 21-percent overall internal rate of return; increased income for fishermen, the fisheries cooperative, and retailers; and a 100 percent increase in seafood production.

3. FINDINGS AND ANALYSIS

The major impact of the Fisheries Development project appears to be a virtual doubling of the market for fresh fish in Djibouti. A sustained social marketing program carried out by CRS has played a central role in this market growth. The principal technological innovation that has accompanied the expansion of the fishing industry is the institution of the cold-chain system by both ACPM and the private sector. However, the growth of the market has still not outstripped the ability of fishermen to meet demand with traditional technologies. Until that happens, technology transfer will be limited.

3.1 Status of the Technological System

Table 1 is a schematic presentation of the technologies put in place by the Fisheries Development project. Fish is the primary product of the project, and marketing and production are its primary processes and the primary areas of knowledge the project has extended.

3.1.1 Production

Fishermen have embraced the fiberglass boat repair technology. The boat repair yard has refitted 22 boats and is now experimenting with all-fiberglass boats built according to the standard local design. One of the new all-fiberglass boats is performing so well that the project is considering replacing the C-flex fiberglass repair technology with the building of all-fiberglass boats.

Despite its reception, the fiberglass technologies have led to no significant increase in the size of the fishing fleet. Fishermen have simply been refurbishing their wooden boats with fiberglass. Adoption of all-fiberglass boats is also unlikely to lead to an increase in fleet size in the near term.

Table 1. Technology Transfer Under the Djibouti Fisheries Development Project

	Primary	Ancillary	Linkages
Products	Fish	Boats Motors Equipment (lines, hooks) Hull sheathing Ice	Fuel Lubricant Running water Fiberglass Electricity
Processes			
Marketing	Processing Transport Preservation Management Merchandising ACPM Kiosks Central market	Ice making and selling Equipment repair and maintenance Social marketing Training	Taxis, buses, tr Technical assist Labor supply Clerical, etc. Mechanics Carpenters Refrigerator technicians
Production	Handlines Gillnets Traps	Icing/preservation Evisceration Transport Management Training Engine and boat maintenance	Labor supply Mechanics Carpenters Refrigerator technicians Technical Assist
Knowledge			
Marketing	Techniques of preservation and preparation Merchandising Methods Marketing system	Market demand Price levels	Larger social an economic condit related to dema and consumption Management pract
Production	Fish behavior Fishing Techniques Vessel Operation	Seamanship Fish preservation Market demand Price levels	Weather forecast

Fishermen have also been exchanging project motors for their old motors for motors provided by the project because of the availability of spare parts, and repair and maintenance service.

Fishermen now take ice with them in small ice chests supplied by the project when they go fishing. Fish is generally kept on ice from capture to port. This practice appears to be followed by fishermen selling through private channels as well as those selling through ACPM.

However, fishermen have not adopted other parts of the production technology. The monofilament fishing lines promoted by the project cut their hands. Fishermen found project nets hard to handle because they absorb so much water; also sharks get tangled in the mesh and tear the nets.

Nevertheless, the production process has incorporated several supporting techniques and technologies, including icing to preserve fish, evisceration, and motor and boat repair and maintenance. Both ACPM and the private sector have taken measures to ensure the availability of these new technologies. In addition, five or six of the most productive fishermen have now ordered larger boats with in-board diesel engines and winches to permit trap fishing. They are impressed with the

possibilities of a technology that would enable them to go farther from shore, and stay out longer in different kinds of weather--and at lower cost than the present technology allows.

The training component of the Fisheries Development project has been weak. Fishermen have acquired no new knowledge about fishing grounds, fish behavior, fishing techniques, or vessel operation.

3.1.2 Processing

As with fish production, the technologies the project has introduced to handle and process fish have not been completely or effectively adopted.

Although the processing facility is operational, it is not particularly efficient or well-managed. The activities within the facility are under the control more of the workers than of management. The workers were part of the processing scheme before the project management assumed control of the plant and have continued their activities largely undisturbed. The filleting and skinning operations are well executed if not very well organized.

The facility supplies ice for its own and its fishermen's needs. Most of the fresh fish is packed in ice to avoid spoilage (the second project amendment focused on improving fish treatment and handling in ACPM cold stores and freezers.) Product losses have dropped because of better inventory controls, a first in/first out storage policy, fish glazing before freezing, better protection of stored fish, and better use of the storage space. Nevertheless, fish are still not well protected from desiccation in the freezer.

Private sector fish processors have not yet adopted all the handling and processing techniques now used by ACPM. They fillet fish and have adopted the idea of the cold chain to keep fish fresh. Their suppliers take ice with them on their boats, and processors have access to cold stores and freezers at a Government-owned facility in the port area. However, processors use these facilities much in the same haphazard manner as did ACPM before the project.

Both ACPM and private sector facilities are underutilized, especially during the slack season, from November through April, when the fresh fish market absorbs all fish production. Processors build up their freezer stocks from May through October. ACPM sells off its stocks to institutional customers. The private sector sells to institutional customers and exports to Saudi Arabia.

3.1.3 Marketing

Fish is distributed through three types of outlets: the ACPM sales hall, kiosks, and the central market, ACPM sells most of its stocks to the public directly at its fish processing facility, whose sales hall is used for both wholesale and retail business. About two-thirds of its sales are to institutional customers, restaurants, military canteens, private voluntary organizations, and retail kiosk managers. The remaining third is sold directly to consumers.

Kiosks serve as another retail outlet for ACPM. While the ACPM sales hall is busy, the retail sales kiosks operate erratically. The evaluation team visited four of the kiosks. In one kiosk, fish were displayed in the bright sun without ice while ice was melting on the ground just outside the kiosk door. In another kiosk, there was no evidence that ice was being used even to transport the fish.

The final type of outlet is the central market. Although fish displayed in the central market appeared to be fresh, there was no evidence of ice being used in handling.

The size of the fish market has doubled since 1980, thanks to the project marketing system and the success of its social marketing program. The evaluation team estimated national fish

production for the 12 months ending March 1985 at 550 to 600 metric tons. This figure is up from an estimated 235 tons in 1979, 298 tons in 1980, and 421 tons in 1981.

Although ACPM has made progress in its knowledge of how to handle and treat fish for the market, it has not had a formal marketing strategy. (A marketing adviser position exists under Phase II of the A.I.D. project, which is being filled by the former coordinator of the IFAD team.) In the early 1980s, ACPM marketed about 70 percent of the national catch. Since then the tonnage handled by ACPM has been declining even though consumption has continued to expand. ACPM's share of the market has fallen to around 50 percent. The private sector has shown greater mastery of marketing than has ACPM and has expanded rapidly to handle the dramatic production increases brought about by the project.

ACPM is purposely ignoring free market forces in its pricing policy, which handicaps its performance in the market. Although ACPM differentiates among fish species in its pricing structure, it pays fishermen a set price year-round for each species.

ACPM's pricing policy may be maintaining fish prices at an artificially high level, given ACPM's dominant position in the

market. Or it may be that demand for fish has expanded so rapidly that, despite a doubling of supply since 1980, the price for fish has remained steady.

3.2 Project Impacts

The most striking feature of the Fisheries Development project is its impact on the development of the fisheries industry beyond the project's direct influence. In 1979, 1980, and 1981, a series of reports estimated that ACPM was handling 70 percent of the national fish catch. According to interviews with members of the project implementation team and with SEP and ACPM management, ACPM was handling only 50 percent of the national fish catch in 1985. A review of the books of the largest private wholesale fish merchant in Djibouti basically comfirmed this estimate. About 280 tons of fish passed through ACPM in 1984, so the national catch must have been about 550 to 600 tons that year. The project has made impressive progress toward its goal of increasing fish production and consumption in Djibouti, although it has done less well in the goal of building ACPM into a strong, viable institution.

The project has had a positive impact on fishing technology. Fishermen have seen the benefits of fiberglass-hull sheathing for their boats and, more recently, of acquiring

all-fiberglass boats. They come to ACPM for access to these and other technologies. ACPM has a revolving credit fund that allows fishermen to buy boats and motors. The repayment rate on the revolving fund has been about 85 to 90 percent.

ACPM has made two critical decisions that have set the course of its development. The first has been to draw up a yearly fixed-price schedule. (Table 2 presents the January 1984 price structure for various fish species.) The second decision has been to buy any kind of fish a fisherman has to sell, rather than to buy selectively. ACPM believed these two policies would encourage fishermen to adopt new technologies to expand production and sales.

The problem with this approach is that ACPM producer prices are higher than the free market prices during the season, when supply gluts the market, and lower during the season, when there is a short supply of fish. A fisherman, therefore, has an interest in selling in the private market from November through April and through ACPM from May through October. The danger for ACPM is that it will be saddled with the less marketable species during the scarcity season and overwhelmed with fish during the glut season. To guard against this danger, ACPM has an additional policy of purchasing first from its most faithful suppliers during the glut season. Thus, to maintain access to a line of credit and to have an assured market during the glut

season, suppliers sell a significant share of their catch--including preferred varieties--through ACPM during the scarcity season.

Table 2. ACPM Pricing for Principal Fish Species, January 1984 (Djiboutian transfer kilogram)

Species	Paid to Fishermen	Paid by ACPM's Institutional Customers	Paid at ACPM's Retail Stand
Thazard	300	400	500
Small Jacks	300	400	450
Small Dorades	300	350	400
Barracuda	300	350	400
Mulet	250	330	400
Tuna	220	300	400
Shark	130	500 (filet)	600 (filet)
Grouper	220	700 (filet)	800 (filet)

Note: FD is Djiboutian francs (177 FD = $1.00)

Consultant reports and evaluations indicate that the high price of fish has limited fish consumption among the mass of Djiboutians. Since one of the objectives of the project was to increase fish consumption, for both nutritional and macroeconomic reasons, ACPM lowered prices in March 1984. It reduced the producer price by about FD 50 per kilogram across the board. ACPM adjusted its wholesale and retail prices

accordingly. Private wholesalers took advantage of the situation to reduce their producer prices by FD 20-30 per kilogram. The retail price of fish in the private market appears to have stayed firm, however.

The ACPM price reduction has not, in fact, lowered consumer prices and increased fish consumption by the masses. Rather, it has reduced ACPM's share of the market from about 70 percent to about 50 percent by driving more fishermen to sell to the private sector.

The majority of fishermen still come to ACPM to buy their equipment. About half of them pay cash for their purchases but sell very little of their catch to ACPM. About 60 fishermen support ACPM by funneling most if not all of their production to the cooperative. Of these 60, about 18 provide the bulk of ACPM stocks.

The fishermen who provide the core support for ACPM are disproportionately based on the northern shores of the Gulf of Tadjoura. Fishermen whose home base is on the south of the Gulf tend to market their fish through private channels in the city. There is an ethnic difference between these two areas. The northerners are predominently Afars, although there are Yemenis in the group, while the southerners are predominently Issas, with some Somalis in the group.

Location and access to markets, however, are more important determinants of behavior than ethnic allegiance. ACPM is promoting the development of Tadjoura as a staging area to permit fishermen to exploit the fishing grounds off Khor Angar, the richest fishing area in the country. The site, toward the Ethiopian border, is easily reached from the northern ports on the Gulf.

Twice a week, ACPM sends a boat to Tadjoura twice a week to pick up the catch and bring it to Djibouti. Prior to the initiation of the project, local fishermen had little access to Djibouti, the Country's largest market. They therefore dried a large share of the fish they caught and sold it in Yemen. They now have the alternative of selling fresh fish to ACPM.

In effect, ACPM is facilitating the access of Northern fishermen to the biggest market in the country, a market to which fishermen based in Djibouti and its vicinity already have good access. They use their personal contacts in the private sector to channel their product to the market. The big question is what will happen when the private sector begins to send transport vessels to Tadjoura in competition with ACPM.

3.3 Technology Transfer as a Systematic Process

Fish production is a process that starts with the catch and moves through processing and marketing to bring the product to the consumer. The only way to increase fish production and consumption is to address the whole system, not just isolated segments. Technology transfers at each segment are mutually supportive and bring the overall system to a higher level of productivity. Thus, increasing productivity at only one point in the system does not ensure the ability of the rest of the system to handle the new requirements.

From the design phase, the Fisheries Development project has sought to affect all of the fishery subsystems, from supplying production inputs to marketing output. Building demand for fish has been an important part of the project. As a result, production has had to expand greatly to meet growing demand. These production increases would not have been possible without the systems approach to the development of production and marketing followed by the project. Ideally, however, the project should also be feeding back information from the market to identify the production and processing subsystems necessary to satisfy demand. What is needed now is a more systematic approach to meeting the growing market demand for fish.

Project efforts at all levels in the system have stimulated expansion of the fisheries sector even outside the area of direct project involvement. The growth of the market has sent signals to the private sector actors in the fisheries sector as well. Thus, for example, ACPM's operation of the fish processing plant has set the standard for fish processing that the private sector has more or less adopted.

However, disadvantages to the systems approach emerged as various components of the project fell behind schedule for one reason or another. The consequent prolongation of donor involvement, however, probably contributed to the success of the project. Otherwise it is questionable whether the system could have absorbed the technological changes in any effective way and whether the private sector fisheries industry could have responded as it did.

Thus, for example, oyster culture, a project component that was later abandoned, did not fit into the project system. Project concern with exploratory fishing was premature since fish are plentiful enough in known waters, given present fishing technology.

3.4 The Private Sector

3.4.1 Fishermen

Fishermen do not constitute a large segment of those involved in the fisheries industry, and their enterprises are generally quite small. The group, however, exhibits many of the characteristics of larger scale operators in the fishing industry. For example, although all boat owners at one time operated their own boats, not all of them currently do so. Non-operating owners now largely manage such matters as the purchasing of supplies and equipment and the sale of fish.

Multiple boat ownership indicates entrepreneurial optimism about the future of the industry. Outside the project entrepreneurs pay open market prices for capital and operating inputs. Yet many are expanding their operations. (Within the project, where inputs are subsidized, the signals are more difficult to read.)

Most private sector participants in the Djiboutian fishing industry are owner/operators. They rely on the project for credit, access to equipment, inputs at below market cost. They sell their catch to both ACPM and private dealers to optimize net market returns over the year.

3.4.2 Fish Merchants

Fish merchandising strategies are similar at kiosks and the central market. Fish is displayed in 1- inch by 2-inch pieces. The main difference between the kiosks and the central market is that most of the sellers at the central market operate with a roof over their heads; consequently, the fish are protected from the sun. There are, however, a few operators outside the central market building whose fish is exposed to the elements. There is no evidence that any of the merchants uses ice.

The facilities are adequate for the sale of fish but space is badly used, and sanitary conditions are poor. Sellers crowd into the central aisle in order to catch the attention of passers-by, because they are afraid clients will ignore them if they operate within their stalls. The result is congestion in the center and wasted space along the walls.

The fish sold in the central market comes from several sources. Some comes directly from individual fishermen. However, there is one integrated operator who, in addition to having his own catch, buys fish from other fishermen and also obtains fish from Somalia.

The emergence of this integrated operator is an important development in the fisheries system. With the aid of his sons, he he operates an enterprise with three boats with in-board diesels and two dorries with outboards, a cold store, he and a transport service. He freezes fish for the domestic institutional and export markets. In the last year, he sold 30 metric tons of frozen fish to Saudi Arabia. He handles as much as one-third of all the fish sold in Djibouti.

His producer price during the scarcity season is more favorable than ACPM's. Thus, even fishermen who purchase equipment and supplies at low prices from ACPM sell their fish to him when it is to their advantage.

3.4.3 Retail Kiosks

Kiosk sales are a segment of the fisheries system that has been slow to develop and become operational. The volume of sales in some of the kiosks is so low that it is not clear how entrepreneurs meet their expenses. Fish-handling techniques in some of the kiosks are inferior to those in the public market. Under these conditions fish quality deteriorates rapidly.

3.5 Sustaining the Process of Technological Growth

The project could benefit from some structural changes and modification of scope to sustain the process of technological growth. There are four areas in which some change is desirable:

1. ACPM's role in selecting and testing technologies. The ACPM fish processing facility, which was functioning as a private enterprise, is no longer economically viable. SEP and the project team have given ACPM a social and economic agenda that it cannot carry out without subsidization. Furthermore, because of the public nature of the enterprise, it is unlikely that ACPM could ever function as an economically independent and profitable activity.

The most difficult role assigned to ACPM is that of stabilizing prices. Because ACPM cannot act as a private sector buyer it is badly handicapped in dealing with a mass of private sector suppliers. For this more than any other reason, ACPM's market shore is declining.

As a public institution, ACPM has a role to play in testing and selecting technologies for use in the production, marketing, and transport sectors of the industry. ACPM can most effectively function as a gatekeeper to transfer technology to

the private sector, which is ready to make investments in the industry. Moreover, ACPM is a force to assure investors of the public sector commitment to fisheries development.

2. Extension and training. As part of its mandate to test and appraise new technologies, ACPM must develop a methodology for disseminating the results of its findings throughout the fishing industry. ACPM is not an appropriate vehicle for providing extension services and training because of the need to include all elements of the fishery industry, including those that are directly involved in the project. Training, which has largely been neglected or ineffective, and extension services should consititute a major part of SEP responsibilities.

3. Private sector activities. The private sector has shown considerable vitality in the fishing industry. Fishermen and private sector sellers have siphoned off about half the national fish catch into channels outside the project where producer prices are higher during the low-supply seasons. Clearly, the private sector feels an incentive to adopt technologies to maximize its net return.

Fishermen take advantage of low ACPM equipment prices and cheap credit to acquire the boats and motors the project makes available. For cost and financing reasons, fishermen accept ACPM's choice of specific technologies for them in areas in

which they already feel a need for improvement. Some pay cash for their purchases. However, many prefer to pay ACPM by delivering non-preferred fish varieties during the low supply season or by concentrating their deliveries on the glut season, when ACPM's producer prices are higher than those of the private sector.

In terms of meeting project goals, as long as production and consumption grow, it is not important per se whether growth focuses on the public or private sector. Thus, a policy of dealing only with fishermen whose allegiance is to ACPM is, shortsighted and should be changed. The private sector has shown a capacity to respond to technologies and changes to the fishing industry that have been introduced by the project. The project should involve this sector through training, extension programs, and credit assistance.

4. The market for fish in Djibouti has expanded enough to absorb the substantial increase in production without price weakness. The social marketing program must be credited with contributing to this expanded market. All social marketing programs should continue; in particular, the television and radio information diffusion and promotions need to be expanded.

3.6 Institution Building and Policy Development

3.6.1 Emphasis on Artisan Fisheries Development

The Fisheries Development project has been focused on developing the artisan fishery, using marketing system support. Yet ACPM is now programming for two larger boats with high-seas capabilities to supply fish for its processing facility.

This shift reflects ACPM's pessimism about fishermen's willingness to keep ACPM supplied at its producer price levels. Otherwise a deep-sea focus is premature. The artisan sector has not yet come close to exhausting the country's near-shore resource potential. Moreover, large vessels mean increasing public sector investment and support costs and the risk of increasing subsidies for both management and infrastructure. Although there is no need for large, seagoing vessels, the sector could use larger boats than those ACPM has been procuring. Several fishermen have ordered 15-foot launches with in-board diesels.

3.6.2 Project Management

The project has been the victim of multiple agendas and sources of funding. A clarification of project responsibilities and the roles of ACPM and SEP will facilitate a more effective approach to management at various levels. ACPM has not mastered the operational implications of the technologies it is managing. The project technical assistance team has fostered financial responsibility but not technical efficiency. More effective training could overcome these deficiencies.

In addition, ACPM management has to recognize the significance of the private sector and its own shrinking prominence in fisheries operations and marketing.

3.6.3 Social Marketing

Both the short- and the long-term activities of the social marketing programs must continue. The nutrition education programs and instruction in fish preparation have a long-term impact on dietary habits and can be continued in the Mother/Child Health Centers and the schools.

Radio and televison provide a better vehicle for immediate impact, and attention should be given to designing and implementing the strongest media programs possible.

3.7 Management Capacity

Management skills have not been developed as much as they might have been during the life of the Fisheries Development project. Also, management has not had the technical skills needed to track the functioning of many aspects of the fisheries production. Three areas, in particular need attention.

The linkage between production and marketing. The project has not acknowledged the rest of the fish processing and marketing industry except as a competitor of ACPM. This imputes a commitment to institutional development to the project that does not follow from the statement of its goal, to improve the lot of Djibouti's consumers and producers.

The capacity of the private sector to process and market fish has grown much faster than that of ACPM. At the same time, the project's buying and selling system requires various subsidies, which will only grow with the expansion of ACPM

production under current price and management systems. Therefore, it is important that the project explore ways of reinforcing private sector production and marketing channels.

Adaptation of technical assistance to local conditions. The project's success in increasing production would have been even greater had there been a more personal approach to technical assistance. A close working relationship never developed between the market operators, the fishermen, and the project technical assistance team. An exception is the social marketing program, in which those providing the assistance have continuous personal interaction with their target groups.

The training of host country personnel for interaction with people in the marketplace and with the fishermen should advance as rapidly as possible. The host country management group needs the opportunity to develop technical and administrative skills in an environment in which the emphasis is on defining management objectives.

Financial Management and record keeping. ACPM had a great difficulty keeping track of its accounts, product inventory, supply inventory, and so on. For that reason, an accounting specialist joined the A.I.D. project team in early 1984. He has put in place inventory control systems, a double entry bookkeeping system, and a petty cash accounting system. He has

also trained ACPM personnel to maintain these systems after his departure. However, these personnel are not yet able to close the books for an accounting period and draw up a balance sheet.

The chief of party for A.I.D.'s Phase II project team is a management specialist. The chief of party for the Phase I team was a fisheries specialist. This change is an indication of the commitment of all parties concerned to strengthening ACPM's management capacity.

3.8 Timing and Problems of Co-ordination

The Fisheries Development project was planned in such an unrealistically short period that not enough time was alloted for the project to adopt and adapt technologies effectively.

Although there were difficulties coordinating the implementation of the various donor project components, this did not really hurt the project since delays and poor coordination prolonged donor commitment to the project. For example, A.I.D. prolonged Phase I and increased its project funding when it realized that the retail kiosks, whose construction was an IFAD responsibility, were an essential part of the project system. The project needed a network of retail outlets as demand signals to motivate producers.

No unusual opportunities were lost as a result of timing problems. On the other hand exploitation of the biggest unanticipated opportunity, the expansion of the private sector market, has been serendipitous--the result of prolonged project assistance rather than a conscious project strategy.

Although delays prolonged donor involvement in the project, there are advantages in planning a long-term donor commitment from the outset. Changes in the scope and time horizon of the project have led to uncertainties and wasteful reorientations of project efforts. Given the time it takes for successful technology transfer to take hold, A.I.D. should have programmed the Djibouti Fisheries Development Project for 5 years.

4. LESSONS LEARNED AND POLICY IMPLICATIONS

The most important lesson of the this project regarding technology transfer is that technology transfer, at its most successful, continues beyond the project. Therefore, the project should build an outreach capacity into its structure in order to identify and support independent efforts to adopt turning project-introduced technologies. In the Djibouti Fisheries Development project the private sector is incorporating technology innovations introduced through the

project. But the project has not acknowledged the private sector, particularly the aggressive role that the sector is playing in the growth of the fishing industry.

A second lesson is that the role of a public sector institution in the technology transfer process must be defined carefully. The public institution plays the role of technology champion and gatekeeper well. It is the best actor for courting international donors and financial intermediaries. It is in the best position to recruit experts, to program their activities, and to disseminate the conclusions of their studies. But a public sector institution has too much overhead to operate economically in the private sector. Moreover, it is usually encumbered with cross-cutting objectives and policies that interfere with reception, interpretation, and follow-up of clear signals from technology users. Therefore, public sector institutions usually play an important but limited role in technology transfer, with the private sector then taking over implementation and feed back roles.

A third important lesson is that technology transfer takes place as part of a system. Innovations are not effective in isolation, and different parts of the system reinforce each other. Thus, the system has to take into account each step from production through consumption. Marketing plays a leading role in technology transfer by energizing the system in two ways: by

increasing the demand for the product the technology produces and by championing the use of the technology its benefits to users. Therefore, a social marketing program and a training and extension program are both important to the success of technology transfer.

A fourth lesson is that communication systems are an integral part of the system of technology transfer. They serve as the outreach instrument for recruiting users of the technology. Moreover, communication systems provide feedback on the adaptations of the technology. Thus, strategies for disseminating knowledge and circulating information, are important in the design of a technology transfer project.

A final important lesson is that a successful technology transfer requires a relatively long-term commitment. The process goes through several stages. A potential technology system must be identified, tested, and extended to groups of end-users. They, in turn, put it through a period of refinement and adaptation based on their field experiences. At this point, it is ready for mass adoption.

APPENDIX

METHODOLOGY

A two person evaluation team, an anthropologist and a fisheries economist, carried out this evaluation in March 1985. The anthropologist spent 2 days in Rome with Food and Agriculture Organization (FAO) and International Fund for Agricultural Development (IFAD) personnel responsible for their organizations' activities and components supporting Djibouti fisheries development. He also collected relevant documents.

In Djibouti, the team visited the following sites of interest to the project:

-- The Cooperative Association for Maritime Fishing (ACPM) fish processing plant. The plant not only exhibits the project's fish-handling system, it also houses the administrative headquarters of the SEP, ACPM, and the A.I.D. project team.

-- The central market. The fish marketing shed exhibits the technologies and techniques current in private sector fish marketing.

-- The fish-handling facility at Obock. A visit to the facility included interviews with local fishermen and a glimpse of the role of fishing in the north of the Gulf of Tadjoura.

-- The cold storage plant at the port. The evaluation team was introduced to the largest private fish merchant in Djibouti and learned of his activities and his views on the prospects for the fishing industry.

-- Four retailing kiosks in the city of Djibouti. The visit to the kiosks provided some information on the practices, volume of business, and the potential of these retail outlets.

-- Mother/Child Health Center. The visit to this center exposed the evaluation team to one component of the Catholic Relief Services (CRS) social marketing program.

-- Home economics class. The visit to the home economies class exposed the evaluation team to another component of the CRS social marketing program.

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