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FOOD AND AGRICULTURE SECTOR ASSESSMENT

FISHERIES SECTOR ASSESSMENT
AND ASSISTANCE OPTIONS

prepared by



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MAURITANIA FOOD AND AGRICULTURE SECTOR ASSESSMENT

ASSESSMENT AND PROPOSALS FOR FISHERIES

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CONTENTS

- I. SUMMARY
 - II. THE STATE OF THE FISHERIES SECTOR
 - Inland Fishery
 - Fish Farming
 - Artisanal Marine Fishery
 - Nouakchott
 - Nouadhibou
 - Fishing Cooperatives
 - Markets and Value of the Artisanal Fishery
 - Projected Domestic Demand for Fish
 - Industrial Marine Fisheries
 - Sustainable Resource
 - Fishing Vessels
 - Shore Facilities
 - Pelagic Fish Processing
 - Demersal Fish Processing
 - Fish Exports
 - Employment
 - Nationalism, Moorish Perceptions, Foreign Dependence
and the New Fishery Policy of 1979
 - III. ONGOING AND PROPOSED DEVELOPMENT EFFORTS
 - Inland Fisheries
 - Fish Farming
 - Marine Artisanal Fisheries
 - Industrial Marine Fisheries
 - IV. POLITICAL AND INSTITUTIONAL CONSTRAINTS FOR THE RATIONAL
EXPLOITATION OF COMMERCIAL MARINE FISHERY RESOURCES
 - V. CONDITIONS FOR A FEASIBLE MAURITANIAN ROLE IN COMMERCIAL MARINE
FISHING
 - VI. SOME PROPOSALS FOR POSSIBLE USAID INVOLVEMENT IN THE FISHERIES
SECTOR
- REFERENCES

I. SUMMARY

The ten year drought of the 1970's has decreased the production of inland fish in the Senegal River Valley. Some of this deficit demand has been met by the growth in the artisanal marine fishery. The continued growth of this sector, to 40,000 tons per annum, should more than provide for the projected demand of 33,000 tons by the end of the century. The greater reliability of marine fish production, the development of a marketing network and the proposed damming of the river combine to make development of a marine fishery more cost effective than that of inland fisheries or aquaculture.

The industrial fishery, one of the world's richest, has been dominated by foreign fleets who have harvested some 600,000 tons per year, valued at nearly \$300 million. With the new Fisheries Policy of 1979 Mauritania has attempted to regain control of this resource by restricting all fishing to Mauritanian-controlled, foreign-capitalized joint ventures. However, the economic yield to the GIRM is constrained by the tendency to maximize political ends and short-term personal objectives at the expense of long-term national interests.

Two projects might be considered by AID. The first is a ship repair facility that would remedy an expressed need in the fisheries infrastructure. The second, a long-term gamble on eventual change in GIRM traditional policy, would help develop a corps of trained fisheries managers and provide them with a much needed base line of data with which they might have a chance to manage Mauritania's fishery on an economically sustainable basis.

II. THE STATE OF THE FISHERIES SECTOR

There are three types of fishery in Mauritania:

(1) The inland fish harvest of the Senegal River and its seasonally inundated floodplain. This harvest has contracted during the 1968-82 succession of droughts, from about 10,000 tons to only a few hundred tons of fish per annum.

(2) The marine artisanal fishery has expanded to meet part of the deficit caused by the decline in the riverine fishery. About 4,000 tons of marine fish are annually landed at, and sold from, Nouakchott. Another 6,000-7,000 tons of fish are landed by the artisanal fishermen in Nouadhibou, primarily for industrial processing. A small part of this total is transported from isolated Imraguen villages between the two cities. Traditionally the Moors have not eaten fish and consequently Mauritanian artisanal fisheries have been insignificant until recently. The artisanal marine fishery has not grown fast enough to compensate the decline of the riverine fishery, and no doubt some of the demand for fish on the Mauritanian side of the Senegal River has been met by unofficial imports of fish from Senegal.

(3) The industrial fishery within the Exclusive Economic Zone (EEZ) of Mauritania is potentially one of the most valuable in the world, with an estimated sustainable yield of about 600,000 tons per annum, valued at perhaps U.S. \$300 million. The fishery has been heavily exploited since the late 1960's by perhaps a dozen major foreign fishing fleets processing at sea or at Las Palmas, whence the fish have been exported. During the 1970's less than 10% of the total fish catch (an average of 45,000 tons per year) was landed at Nouadhibou, and export values averaged about U.S. \$13 million from a generally unhealthy industrial sector. Since the New Fisheries Policy was instituted in 1979 to give Mauritanian-controlled joint ventures sole access to the resource, fish landings and export value have declined further. However, new infrastructure under construction, and a government decree to require landing in Mauritania of all fish caught in the EEZ, may improve the viability of the industrial fishery over the long-term.

Inland Fishery

An estimated 2,700 professional fishermen (RAMS SS 5 page 45) fish along the Mauritanian shore of the Senegal River. Many more part-time fishermen farmers have traditionally harvested fish from the flood plain. The demand for fish in the valley was reported to be 66 kg. per person-year (ibid., p. 51). The fishermen were thought to be sophisticated, well organized and well equipped and with relatively high income. Since the drought and consequent reduction of fish stocks in the river, some of these fishermen--Lebus of the Wolof people--have gone to the coast and joined the artisanal marine fleet. The Soninke people, among others, have developed a marketing infrastructure to distribute marine fish to the interior.

Fishery production of the Senegal River Valley varies enormously from year to year depending on rainfall and the consequent inundation of the river floodplain. Fish reproduction follows the flood cycle: the rich, shallow waters of the flooded plain provide food and suitable environment for growth and reproduction and thus an increase in the harvestable biomass of fish. As the floodwaters recede, the fish are concentrated and many of the more than one hundred species are harvested in the year-round fishery.

The irregular fluctuation of the annual flood causes the inland fish harvest to vary from year to year by a factor of ten. RAMS (ibid., page 39) calculates the potential harvest from 200,000 ha of floodplain on the Mauritanian side of the river at 60 kg per ha, or a total potential catch of 12,000 tons per annum when the entire floodplain is inundated.

The estimated Mauritanian harvest in 1968 was 10,400 tons. This was about 30% of the total catch, the rest going to Senegal on the other side of the river. The long series of drought years since then, with fish stocks unable to increase to their potential, and overfishing on these constricted stocks, has resulted in sharply decreased catches. The 1980 catch was reported to be only about 800 tons (ibid., p. 47). The possibility of full recovery of these overexploited stocks will be severely limited by the eventual upriver damming of the Senegal at Manantali. This stream flow control will minimize the extent of annual flooding and therefore reduce the tonnage of harvestable fish in favor of agricultural crop production.

The proposed dams will change the nature and location of water masses along the river and the net result is expected to be stabilization of the inland fishery harvest at a potential maximum between 4,500 and 9,500 tons per year. The final total will depend on possible increased production from permanent lakes (ibid., p. 60) and the ability of the fishermen to adapt their fishing techniques and resources to the new conditions (availability of nutrients, control of water weeds, standing trees, etc.) and on the marketability of the dominant fish species in the lakes.

Fish Farming

Fish cultivation is not yet practiced in Mauritania. On the other side of the Senegal River some experimental Tilapia cultivation has been established by USAID with Peace Corps technical assistance. Fish farms have been organized as village cooperatives on government-expropriated non-agricultural (or poorly productive) lands. The experiment does not seem to have been fully successful owing to problems that by now are classic in African fish farming projects:

- early breeding in the ponds limits the harvestable size of fish;
- poor maintenance, limited feeding, and insufficient compost fertilization, due in part to limited responsibility taken by cooperative members;

- disappointment with the per-member yield, the size of fish, and the return on energy invested, and
- negative return on investment.

Perhaps greater success is possible for private investors in fish farming far upriver where the high delivered cost of marine fish could permit fish farmers to compete successfully. However, a high technology support structure would be required (fish hatchery production of all male hybrid tilapia or carp species) and farmers would need to be convinced that the risks would be compensated by the returns, by means of demonstration ponds and extension staff. Given the enormity of the marine resource and the growing establishment of a marketing infrastructure it is hardly likely that fishpond production would be a useful investment for provision of large quantities of fish.

It is conceivable that with better rainfall the inland fishery could expand again to its former level of 10,000 tons per annum until such a time as the structure of the river becomes affected by the Manantali. The fish adapted to this river ecosystem have enormous powers of recuperation. In fact, the development of the marine fishery has, no doubt, reduced pressure on the decimated riverine stocks.

Artisanal Marine Fishery

The total annual production of the coastal fishery is variously estimated at 10,000-12,000 tons, about half of which is taken by expatriate Senegalese and Beninois canoe fishermen clustered around Nouakchott and Nouadhibou, and from the string of Imraguen coastal villages between the two cities. There are no exact statistics and the inclusion of Canarian or non-Mauritanian black African traditional fishermen has troubled several previous researchers attempting to establish the level of an indigenous artisanal marine fishery.

The development of this fishery since 1970 appears to have been in direct response to the unfulfilled demand in the Senegal River Valley created by the dramatic decrease in fresh water fish production. Approximately 1,000 tons from the Nouakchott artisanal catch, and about 500 tons of the Nouadhibou catch, are distributed to consumers in Mauritania. The remaining 5,000-6,000 tons are harvested north of Cape Timiris for sale to processing plants in Nouadhibou.

Contrary to most artisanal fisheries systems, which have multiple small landings all along the coast, Mauritanian landings are concentrated at Nouakchott and Nouadhibou. The small proportion of Imraguen catch is transferred by truck to one of these centers.

Nouakchott

Much of the 4,000 tons captured by the Nouakchott and Imraguen fishermen in 1980 south of Cape Timiris (Diakhate 1981) is composed of about six varieties:^{1/} bream, grouper and chinchards captured by hand line, the

^{1/}"Variety" means a group of fish not necessarily related taxonomically but sold under a single category.

sciaenids (corvina, capitaine, etc.) taken by gill net, and sardinellas and carangids taken close to shore with surround nets or beach seines. Diakhate (1981) lists 38 species in his analysis of the composition of the 1980 artisanal catch at Nouakchott. About 400 tons of sardinella are sent to Senegal per year and the rest distributed to local markets in Nouakchott and the interior.

Only about 10% of the total catch comes from the Imraguen villages north of Nouakchott; it is brought down by insulated trucks donated by Japanese aid with the help of a UNDP project to improve the Imraguen fisheries. The Imraguen have traditionally concentrated on mullet, for drying and for "poutargue" fish roe, but recently have been landing corvina and shark as well.

Nouadhibou

Sy Moussa (1975, Table 3) reported that 57% of the total artisanal catch landed at Nouadhibou in 1975 was either corvina or shark. In 1982 a great proportion of the catch is still dogfish shark although the urban markets at Zouerat and Nouadhibou may absorb 500 to 1,000 tons per year of demersal first quality fish (bream, grouper, etc.). The "Artisanal Fishermen of Timiris" precooperative claim membership and affiliation of 600-800 fishermen from Nouadhibou and the Imraguen villages north of Cape Timiris. Their figures showed sales in 1981 of 1851 tons to a shore-based freezing plant, of which 75% were dogfish. The cooperative president suggested that local sales were on the order of 6,500 tons, including direct sales to foreign freezer ships, to SIGP for drying, and to the local markets. His figures are perhaps slightly inflated but the order of magnitude is probably correct if one includes the seasonal Senegalese pirogues fishing off Nouadhibou. In previous years a Canarian fleet of seiners supplied perhaps 4,500 tons of pelagic fish to processing plants for fishmeal, and a variable Senegalese fleet landed perhaps 2,000-3,000 tons for some years. By late 1982, the Canarians had gone and the Senegalese had an estimated 50 pirogues at Nouadhibou.

Total production of the artisanal fishery is now estimated at 10,000 tons per year, about double the estimated artisanal catch in 1974-75.^{1/} The increase is due in large measure to Japanese assistance in the form of boats and equipment (see III below), and was fueled by the undersupplied demand from the Senegal River Valley.

Fishing Cooperatives

The artisanal fishery has been organized, with Japanese assistance, into four cooperatives (and precooperatives) in two regions, north and south of Cape Timiris. The organization of two cooperatives in each region

^{1/}J. Brulhet (1974) estimated artisanal landings at 4,891 tons, about 2/3 from pirogues and the rest from the Imraguen. Sy Moussa (1975) supposed a total of 2,227 tons from Imraguens, Senegalese and Dahomian pirogues and Mauritanian fishermen in Nouadhibou, but Talarczak (1976) reported 6,913 tons for the same year, citing 5,879 tons for the Imraguen, surely a gross over-estimate.

was necessary because of the resistance of the various ethnic groups to working together. Only Mauritanian nationals can belong to the cooperatives and these are generally the poorest of the resident artisanal fishermen. Of the estimated 200 canoes usually operating out of Nouakchott, M. Nakamura, head of the Japanese assistance team (personal communication) estimates that 70% were owned by Senegalese. During certain seasons other Senegalese arrive and this fleet expands to about 500 canoes. One of the purposes of the creation of the Nouakchott Cooperatives was to improve the Mauritanian fleet by providing them with equipment equal to that of the Senegalese.

In Nouadhibou the non-national artisanal fishermen are permanent residents of Mauritania.

Table 1 is an attempt to estimate the Mauritanian population employed in artisanal fishery. Nakamura (personal communication) reckons that, in addition, there are always about 1,000 Senegalese fishermen operating from Nouakchott.

Table 1. Mauritanian Artisanal Fishery Cooperatives, 1980

<u>Name of Cooperative</u>	<u>Membership (Number)</u>	<u>Boats (Number)</u>	<u>Equipment Used</u>	<u>Production (1981 Est.) (Tons)</u>
Artisanal Fishermen of Timiris ^{a/}	71 Wolofs & 50 Mauritanians	83 motor launches ^{b/} 36 canoes ^{b/}	handlines purse seines gill nets seines	6,500
Cape Blanc (Nouadhibou)	229 Imraguens	61 sailing launches ^{a/} 17 canoes ^{a/}	seines	
Nouakchott	280 Wolofs (Lebus)	75 canoes ^{c/}	handlines gillnets	3,000
M'Haijrat	146 Imraguens	27 canoes ^{b/} (24 motorized) 12 launches	seines	500
TOTAL	<u>776</u>	<u>311</u>		<u>10,000</u>

^{a/} The cooperative claims about 600-800 but that figure includes non-member affiliates and the 229 Imraguen fishermen.

^{b/} In 1979, 40 motorized canoes and 10 launches were donated by the Japanese. A further 10 diesel launches, 42 motorized canoes, and 300 out-board motors were donated in 1982 but will not be distributed to fishermen until early 1983. In addition, 600 gill nets and 5,000 octopus pots will be distributed to fishermen at a rate consistent with market development.

^{c/} Nakamura estimated that Mauritanians owned about 75% of the nearly 200 canoes at Nouakchott.

Markets and Value of the Artisanal Fishery

The RAMS study (op. cit., p. 52) data indicate a landed value of 64 million UM in 1980 (800 tons at 80 UM per kg.) for the river fishery. The market demand for fresh water fish was reported to be very strong at 7,000-9,000 tons per annum. Current prices reflect the declining supply and growing demand. They have risen from 3-6 UM/kg in 1968 (when production was 10,400 tons) to 80 UM/kg today.

The demand for fish in the interior is at present partially met from the Nouakchott marine fishery by up to 30 specialist fish dealers^{1/}, assisted by general dealers with trucks when the supply is sufficient. The GIRM also helps to distribute fish to inland dealers' chill stores with seven insulated trucks provided by the Japanese. These trucks are also used to transport fish from the Imraguen villages to Nouakchott. Fish may be transported to interior markets either on ice (presently sold by the cooperative) or frozen overnight in the cooperative coldstore. The Japanese are presently building a 10 ton per day ice plant on Nouakchott beach to further facilitate marketing.

The price of fish is 20-35 UM/kg on the beach and 60/80 UM/kg in the interior; it increases in proportion to distance from the coast. There are about 25 specialized fish dealers in Rosso, Kaedi, Kiffa and Aleg. Transportation costs may well account for about 50% of the fish cost to them, and their gross profit may be on the order of 30% of the sale price. Additionally, up to 200 fishermen's wives sell fish to Nouakchott consumers on the beach and door-to-door.

The average landed sale price of the artisanal marine industrial catch in 1980 was calculated at 14.6 UM/kg^{2/} by RAMS (SS-6, page 38). The total value of the artisanal catch can be calculated as 253 million UM, using a mean value of 27 UM/kg for the non-industrial catch of table fish and the RAMS value for freshwater fish, as follows:

Table 2. First Sale Value of the Artisanal Fishery in Mauritania

<u>Value</u>	<u>Production</u> (Tons)	<u>Unit Price</u> (UM/kg)	<u>Total</u> (Million UM)
Freshwater catch	800	80	64
Marine non-industrial	3,750	27	101.3
Marine industrial	<u>6,000</u>	14.6	<u>87.6</u>
TOTAL	<u>10,550</u>		<u>252.9</u>

The RAMS (AS 4, Table II-4) estimate of the 1979 artisanal non-industrial catch, of 175 million UM, is in agreement with these figures.

^{1/} Mostly Soninke, according to Nakamura.

^{2/} This is the same as the current price for dogfish, which makes up most of the artisanal industrial catch.

Projected Domestic Demand for Fish

Fish demand for local consumption can be discriminated into three sectors: the Senegal River Valley, where consumption was reported to be 66 kg/person year (RAMS op. cit., page 51); urban areas where per capita consumption was about 10 kg (ibid. page 43); and rural settled areas within the market network of the fish distribution system. This last group has only begun to eat fish during the past ten years and their consumption is expected to increase. Table III shows an estimated 1980 consumption of about 7,000 tons broken down by sectors, and a projection of potential nation demand in the year 2000 of 33,000 tons, which is in basic agreement with that of the RAMS study (OP 5 pp. 111-112). CILSS (1977) estimated a national per capita annual consumption of 17 kg in the year 2000 and thus a total demand for 44,000 tons. This may be unrealistic because 75%-80% of the population has no tradition of fish consumption. It is not likely that the introduction and marketing of fish will be so successful as to change traditional food habits of the Moorish majority in Mauritania within 15 years.

Table 3. Projected Population Increase and Fish Consumption

	<u>Population^{a/}</u> (Thousands)			<u>Fish Consumption</u> (kg/person/year)		
	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>1980^{b/}</u>	<u>1990</u>	<u>2000</u>
Urban Areas	237	448	743	10	13	15-18 ^{c/}
Senegal Valley	136	182	257	35	50	66
Settled Rural ^{d/}	342	416	463	-	2	6 ^{e/}
Total projected Consumption (000 tons)				17-33		24-43 ^{c/}
Total projected consumption (000 tons) RAMS				7.1		33

Industrial Marine Fishery

The industrial fishery on the Northwest African shelf developed rapidly from the mid 1960's with the introduction of Russian factory ships and the growth of the Spanish and Asian trawl fisheries. It is often reported

^{a/} From RAMS AS 3, (p. 101).

^{b/} RAMS SS 6 (p. 43) indicated that 3226.6 tons were marketed in urban centers along the Senegal Valley in 1980. This might suggest a consumption of 13.6 kg per person year in urban areas. No doubt much of this fish found its way to rural populations in the valley whose demand of 50-66 per person year were not filled by the 5.9 kg per person/year available from the inland riverine fishery. An unaccounted-for quantity was probably imported from Senegal.

^{c/} Consumption rate from RAMS OP 5, p. 111-112. Maximum per capita consumption was based on nutritional needs of 18 kg per person year for the total projected national population of 2.38 million in the year 2000.

^{d/} Settled rural population in rainfed agricultural areas; this is assumed to be within fish distribution network.

^{e/} Calculated from an estimated one time per week consumption of 120 gm of fish per person.

that the upwelling in this region makes it one of the richest fisheries in the world; much of this resource is within the Mauritanian EEZ. Estimates vary, but according to Doucet (1981 p. 45), the 1977 fish harvest from Mauritanian waters was 545,719 tons, only about 7% of which was landed at Nouadhibou, Mauritania's only fishing port. The 1980 estimated catch was tentatively given by Bergerand (1981) as 553,842 tons. Until recently, the fishery has been totally dominated by foreign fishing fleets.

Sustainable Resource

The fisheries resource is composed of various stocks, each with its own population dynamics and fishing pressures. In quantifying the substantial yield of the resource, the fish catch is usually broken down into groups as follows:

	<u>Maximum Economic Yield^{1/}</u> (Tons)
Pelagic fish (mackerels, horse mackerels, sardinellas, etc.)	440,000
Demersal fish (hake, bream, sole, etc.)	50,000
Cephalopods (octopus, squid, cuttlefish)	42,000
Tuna	10,000
Lobsters	400
Artisanal nearshore fishery	<u>40,000</u>
Total	<u>582,400</u>

Evidence suggests that demersal fish stocks, cephalopods and lobsters are overfished, though pelagic stocks are underexploited (Doucet 1981, Greboval 1982, and several CEECAF working groups in Christy 1979, p. 11).

Conversations with the ORSTOM team of fisheries biologists at the Centre National de Recherches Oceanographiques et de Pêches in November 1982 suggested that the pelagic stocks were now in danger as well.

Fishing Vessels

The industrial fishery has been composed of vessels from as many as twenty countries. In 1975, at least fourteen countries had fishing agreements in Mauritania and 299 vessels were licensed to fish within 30 miles of the coast. In 1977 there were 430 vessels licensed totalling about 150,000 GRT. These boats ranged from tiny 15m Canary Island seiners to enormous Russian super-trawlers of 3,330 GRT that could each harvest an average of 35 tons per day. Most of the trawlers from the

^{1/} Doucet, (1981). The WFA (1980) estimated total available resources to be 669,000 tons: 495,000 pelagic and 174,000 demersal. These large quantities are perhaps the maximum estimated (biologically) sustainable yield rather than the maximum economic yield.

major fleets: Japan, Korea, Spain, Russia, Greece and Italy, were 150-500 GRT and could harvest 2-5 tons of fish per day depending on location, season, annual variation in species abundance, and the number of boats fishing. Most of these boats were based in Las Palmas, where there is well-organized support system for fishing and fish marketing.

The New Fisheries Policy of 1979 was formulated to establish Mauritanian control of its fisheries resource. To this end all vessels must belong to joint ventures that are nominally 51% Mauritanian. Although the policy limits fishing to Mauritanian controlled joint ventures, it places no limit on the permitted tonnages of the joint-venture fleet. No exact figures are available, but it is estimated that the Russian, Rumanian, and East German/Swedish joint venture fleets are composed of about 40 trawlers with a mean size of about 3,000 GRT (Greboval 1962, page 64). These boats alone could harvest the entire sustainable pelagic catch recommended by Doucet (1981, page 66).

Shore Facilities

Although the French have had a fish drying facility (SGIP) at Nouadhibou since 1921, the development of shore facilities occurred primarily between 1967 and 1972 when Spanish, Japanese and other foreign interests established large freezing plants and cold stores which could process more than 50,000 tons of frozen fish per year and about 200,000 tons of fish for fish meal.

Total fish landing for processing at Nouadhibou averaged about 50,000 tons per year during the 1970's (Table 5). For the sake of analysis, fish landings can be divided into low priced pelagic fish (\$50 per ton) which are processed into fish meal, and the higher value bottom fish, especially squid, octopus, and cuttlefish destined for Japan, which are frozen for export at a mean 1981 FOB price of more than \$2,500 per ton (Greboval 1982, p. 36).

Table 5. Industrial Fish Landings in Nouadhibou

Year	<u>Total Landings</u> (Tons)	<u>Cephalopods</u> (Tons)	<u>Fishmeal</u> (Tons)
1970	50,400 ^{3/}	9,200 ^{1/}	25,000 ^{1/}
1971	63,189 ^{3/}	8,400 ^{1/}	40,000 ^{1/}
1972	72,000 ^{1/}	10,000 ^{1/}	43,000 ^{1/}
1973	83,000 ^{1/}	14,400 ^{1/}	51,000 ^{1/}
1974	65,132 ^{3/}	16,809 ^{1/}	39,384 ^{1/}
1975	20,542 ^{3/5/}	15,500 ^{2/}	550 ^{4/}
1976	24,700 ^{4/}	15,841 ^{4/}	6,687 ^{4/}
1977	45,475 ^{4/}	18,405 ^{4/}	22,556 ^{4/}
1978	72,613 ^{4/}	16,964 ^{4/}	49,949 ^{4/}
1979	51,326 ^{4/8/}	6,022 ^{4/}	42,738 ^{4/}
1980	18,130 ^{6/}	2,361 ^{6/}	9,680 ^{6/}
1981	18,638 ^{7/}		

^{1/} Brulhet, 1974, fig. 8 assumes 80% of all frozen product is cephalopod and all pelagic fish for fishmeal.

^{2/} Sy Moussa, 1975.

^{3/} Talarczak, 1976 p. 17-18. Figures appear low and may not consider either Canarian or other vessels not carrying a Mauritanian flag but landing at Nouadhibou.

^{4/} Doucet, 1981 p. 52, includes catch of small Canarian and local seiners.

^{5/} Collofong, 1980, reported total landings for 1977 at 62,760; probably includes Canarian landings.

^{6/} Mohamed O'Cheikh 1981, page 21-24.

^{7/} Banque Centrale de Mauritanie. Bulletin trimestriel de statistique, 1982.

^{8/} Mohamed O'Cheikh, 1980, page 115, reported 1979 landings of 58,052 tons, of which cephalopods, 6,130 and fish meal, 43,842.

Pelagic Fish Processing

The 1970 collapse of the Peruvian anchovy fishery, which supplied 60% of the world's fish meal, gave impetus to the establishment of fish meal factories on shore and fish meal factory ships off shore. By the mid-1970's six fish meal plants at Nouadhibou had the capacity to process more than 200,000 tons of pelagic fish each year (Bruhlet, 1976). Fish meal prices have since fallen and the Peruvian fishery has begun to recover, so that fish meal production now requires closer control for profitability.^{1/}

During the first half of the 1970's pelagic fish landings increased each year to supply the fish meal plants that had been established. Landings of pelagic fish averaged about 40,000 tons per year, which was only sufficient to operate the fish meal plants at 20%-25% capacity. During the second half of the decade landings were even smaller; consequently, processing plants were sold or closed. In addition, the cost and efficiency of processing fish for meal on board a factory ship could not be equalled by a shore plant. During the first five years of the 1970's the factory ship "Interpêche" processed off the coast of Mauritania more than 130,000 tons of pelagic fish valued at \$6.5 million each year.

The joint ventures, established by the New Fisheries Policy of 1979, have concentrated on frozen fish production. Present and planned annual fish meal plant capacity is 78,000 tons of input (MPAT, 1982, page 7).

Demersal Fish Processing

Between SOFRIMA (established in 1967), MAFCO (1971) and IMAPEC (1970), there was sufficient capacity to freeze 145 tons of fish daily in three shifts (35,000 tons per annum). In 1980 IMAPEC was closed and total landings for freezing in Nouadhibou were less than 8,000 tons (Mohamed O. Cheikh, 1981, page 24). Actual operating capacity at the end of 1982 is perhaps 15,000 tons (only SOFRIMA is operating), with an additional 30,000-50,000 tons capacity under construction or rehabilitation. The new joint ventures, each forced by the terms of the joint venture agreements to establish a shore plant, have a planned annual capacity of over 180,000 tons of frozen fish. Even if the fishing companies were to obey the new law of 15 November 1982 to land all fish captured in Mauritanian waters at Nouadhibou, the total capacity planned would be 40,000 tons per annum greater than the total recommended maximum sustainable demersal catch.

Given the high cost of processing at Nouadhibou and the necessity of an economic decision to land only high value cephalopods, the planned processing capacity would be more than four times the sustainable yield of cephalopods. This was indeed the fishing strategy of the Japanese,

^{1/} During the peak years of 1978 and 1979, only 41,000-44,000 tons of fish were processed into fish meal in the IMAPEC (37,500 tons) and COMAPOPE (62,500 tons) facilities (i.e., about 40-45% capacity). In 1980, only 9,700 tons of fish were processed into fish meal (at COMAPOPE), and in 1982 no fish meal is being produced.

Korean and part of the Russian fleet operating in Mauritanian waters during the period 1973-1978, when 75%-85% of total demersal landings were octopus, squid and cuttlefish.

Fish Exports

The export value of these cephalopods accounted for perhaps 65% of all fish exports from Mauritania during the 1970's (Table 6).^{1/} Due to the failure of negotiations on fishing rights, Japan is no longer fishing in Mauritanian waters and cephalopod landings have decreased to almost nothing between 1979 and 1982.

Fishery is the second most important foreign exchange earning export after iron ore; the 1975 fish export value of US\$16.35 million represented 11% of total exports in that year (Frida, 1978, page 6). Even more important was the income to the GIRM from fishing licenses and fines levied on foreign vessels illegally fishing in Mauritanian waters. In 1978, the US\$29 million thus collected was 21% of the total national budget (Doucet, 1981, page 101).

Revenue to the GIRM has declined since 1978 as the old licensing policy was phased out between 1979 and 1981 in favor of the new joint venture fishing policy. The new joint ventures have not yet begun to bring in the expected revenues, but estimates of the net return of the approximately US\$300 million value of the catch would be US\$70-90 million each year for a well-managed fishery (Doucet, 1981, pages 99-101), part of which could accrue to the GIRM as license fees or dividends from their joint ventures. This figure is only the expected return on the fish catch and does not include taxes on, or value added by, shore-based processing. CILSS (1977) estimated that value added at Nouadhibou was US\$350 per ton of frozen demersal fish exported and US\$225 per ton of fish meal.

^{1/} In 1975, it was 66% (FAO 1980), and in 1978 it was 62% (U.S. Department of State, 1981).

Table 6. Fisheries Exports From Mauritania

<u>Year</u>	<u>Tons</u>	<u>Million UM</u>	<u>US \$ Million</u>
1970	20,700	405	7.36
1971	22,600		7.69
1972	33,000	568	12.00
1973	-	503	10.68
1974	28,000	734	15.28
1975	26,500	692	16.34
1976	21,600	749	17.2
1977	27,400	921	19.0
1978	29,400	1,178	24.5
1979	13,800	887	13.0
1980 ^{a/}	77,484	1,965	39.3
1981 ^{a/}	143,375	4,551	91.0

Employment

The industrial fisheries sector has provided employment in shore-based processing as well as on fishing boats. This is in addition to the income from sales to the processing industry by several hundred local artisanal fishermen. In 1975, processing provided 965 jobs that paid 120 million UM in wages. In 1976, there were 1,600 people employed (Frida, 1978, page 20) and in June 1980 the FAO (1980, page 3) reported:

"Although the plants at Nouadhibou are operated below capacity, the industry still provides employment for over 1,000 Mauritians in the processing plants and for an unknown number in supporting industries."

Each foreign vessel fishing in Mauritania's EEZ is required to employ five Mauritians as crew members. Christy (1979) estimated that expenditures for wages, food and clothing per year come to about US\$5,500 per man unit, US\$27,500 per vessel, for a total wage bill in 1978 of US\$5.83 million for the 191 vessels licensed to fish that year (at 45 UM/\$ = 262.4 million UM). In 1981, there were 292 foreign boats authorized to fish. It is not clear whether all vessels comply with the regulations, but it is often rumored that many Mauritanian sailors are paid to remain ashore. Estimates put the number of actually employed at only a few hundred.

Nationalism, Moorish Perceptions, Foreign Dependence
and the New Fisheries Policy of 1979

Although the marine fisheries resource of Mauritania is enormous, the country depends on external technology and fishing capacity to harvest

^{a/} Banque Centrale de Mauritanie, Bulletin trimestriel de statistiques pour 1982. These figures appear to be highly exaggerated since landings (Table 5, page 17) were down for 1980-81. These figures may be estimates of transshipments from Eastern European and other joint venture boats that were permitted to fish but, due to incomplete shore plants, had special permission to land fish outside Mauritania.

the resource. The artisanal fishery at Nouakchott is 70% Senegalese. The Imraguen fishery, traditionally undertaken without boats on seasonal stocks of mullet, began in 1973 to fish from launches of Canarian design, and since 1977 with Japanese donated equipment and FAO-financed French technical assistance. Much of the Nouadhibou-based artisanal fleet is composed of foreign nationals using imported boats, gear and technology.

Until recently, the industrial fleet has been totally foreign, though in 1982 there are several totally private owned Mauritanian fishing companies and nearly 80 Mauritanian-owned boats. Despite the requirements for national sailors on every vessel fishing in Mauritanian waters, only several hundred of the nearly 1,000 sailors trained at Momadou Touré School in Nouadhibou are actually working on fishing boats.

The resource is potentially available: the foreign fishing fleet is prepared to provide the labor and technology required to manifest the potential harvest of fish, and the control of the resource is internationally sanctioned. Thus, Mauritania may invite foreign partners to harvest the fish but intends to dominate the resource and to collect the major portion of the benefit to which she feels entitled. The mutual benefits and responsibilities usually inherent in the Moors' traditional master-tributary relationship break down across cultures when the roles are no longer clearly defined; both partners assume themselves to be masters, and neither owes any allegiance or responsibility to the other. The foreign fishing company maximizes economic ends rather than political ones and is more mobile, more powerful, and more opportunistic than the Moor.

The conflicts arise when the foreign fishing company or bilateral assistance programs see Mauritania as totally dependent on outside capital and technology to harvest their resources. The Mauritanian perceives that the foreigner is usurping his control over the resource and not paying his full tribute for access to the resource. Therefore, though Western economic logic may see the Mauritanian economy as dependent on outside assistance for development, the politically based Moorish position would perhaps see the reverse: foreign nations are dependent on Mauritania to provide access to its valuable resources.

The Moors have not traditionally maximized the accumulation of material goods and the adoption of new technologies; they have maximized political control and distribution of resources while remaining mobile, flexible and opportunistic. They may be said to perceive their fishery not as a national resource, the exploitation of whose potential requires external finance and technology, but as another private resource to be worked by others for Moorish benefit: a chance for an opportunistic profit and increased political advantage.

Mauritania's interest in her deep-sea fisheries resources is relatively recent. Prior to 1970, any vessel fishing beyond six miles from the coast was not considered to be in Mauritanian waters; this was extended to 12 miles in 1971 and to 30 miles in 1972. Between 1972 and 1978 all vessels fishing in Mauritanian waters were required to purchase a license from the Government. Fees varied with the displacement of the vessel. More than 400 foreign fishing boats from as many as twenty countries

fished in Mauritanian waters in the late 1970s. In 1978 the GIRM collected fishing license fees and fines totalling \$29 million for virtually no investment in infrastructure or even in management of the resource. Landings were minimal and shore based production capacity under-utilized.

In order to gain control of the enormous fish resources of Mauritania's EEZ that had until then been exploited by foreign fleets, the GIRM instituted the New Fisheries Policy (NFP) in 1979. The policy does not appear to have been based on maximization of financial return, but rather on assertion of traditional control over the newly discovered resource. Foreign fishing companies must submit to equity control by Mauritanian "shareholders" and land all fish in Nouadhibou. Thus, full domination by Mauritania is imposed, even at the expense of financial return. The GIRM has rushed to establish as many joint ventures as possible, each with unlimited fishing rights, without full cognizance of the economic, or biologically sustainable, yields permissible for profitability. Thus, it appears that the New Fisheries Policy causes Mauritania to pay a high economic price for perceived political advantage and for social domination at the expense of maximum financial return on investment.

The NFP requires that all fishing be done by Mauritanian-controlled (51%) "joint ventures." But the foreign partner is to put up all the capital and equipment, provide a shore based processing facility (freezers and cold store for example), land all fish in Mauritania, and use 75% Mauritanian crew and officers on the fishing vessels.

The extract of the Fourth Development Plan (MPAT, 1981) lists 15 joint ventures with a total planned capitalization of US \$83.2 million. Actually, at the end of 1982, only MSP (East Germany/Sweden), ALMAR (Algeria) SALIMAREM (Libya), and COMACOPE (Korea) appear to have shore facilities under construction or renovation. The only shore plant in operation in November 1982 was SOFRIMA (wholly Mauritanian with 51% Government participation) and SGIP (an old French firm producing very small quantities of dry fish with a local private partner). MAUSSOV (USSR), SIMAR (Romania), PARMICO (Korea), COMAR (Germany) and several totally Mauritanian ventures using chartered boats have reportedly also been fishing under interim agreements that permit them to land at Las Palmas until their shore plant is complete. Negotiations with Nigeria (SIPECO), Japan (MAFCO), Portugal (COMPAPOPE), and international interests based in Bermuda (MAURIPECHE) have ended without agreement. Negotiations with SAMIP (Iraq) have apparently also been halted.

In summary, Mauritanian industrial fishery, though little more than a decade old, is already shadowed by the spectre of over-fishing and the loss of a renewable economic resource with an annual value of about \$300 million. The New Fisheries Policy has not planned development of this resource in the light of a finite sustainable yield of fish, nor, apparently, has it considered the financial risks of shore plant over-capacity in its rush to establish as many potential partnerships as possible. While many Western nations and Japan have found the GIRM negotiating position unrealistic vis a vis the establishment of joint venture fishing companies, several ventures with Arab nationals and Eastern European firms have been formed. It would appear that these ventures have either ignored the obvious financial constraints to success or are prepared to absorb any financial loss as a political cost.

III. ONGOING AND PROPOSED DEVELOPMENT EFFORTS

Inland Fisheries

RAMS (SS 5 page 87) and CILSS (1977) proposed the damming of 1,000 to 2,000 hectares of beli or vindou (natural depressions) to maintain year round water for inland fisheries. Development costs were estimated to be 10,000 UM (\$200 at the rate of 50 UM per dollar) per ha and annual operating cost 2,500 UM (\$50). At a proposed harvest of 500 kgs per ha, 1,000 hectares of lake would support 200 fishermen, each earning about 40,000 UM (\$800) per annum. RAMS operating costs did not include maintenance, amortization of development costs, fishing equipment and lake management to assure such a high productivity. Annual costs per hectare might be closer to 23,000 UM (\$460) which would require a break-even price of 46 UM/kg (42 cents per pound) for the fish harvested. Moreover, unless such natural depressions could be located east of Kaedi, it is doubtful, even if yields could be sustained at 500 kg/ha, that such a fishery could effectively compete with the marine artisanal fishery and its associated marketing and distribution network. The technological risks are enormous. The maintenance of a 1,000 ha fertilized lake at the peak of fish productivity, without risking either eutrophication or overproduction of competitive fish and invertebrates, would be very difficult.

It is highly questionable whether a 10 million UM investment in a single 1,000 ha lake, which might produce a maximum of 500 tons per year with great risk, is a wise investment. Experience indicates that it would be far more profitable to continue to encourage artisanal marine fisheries and improve the distribution system to the interior.

Fish Farming

RAMS SS-5 (page 92) suggested that 4,000 hectares of ponds could be constructed along the Senegal River Valley between Koundi and Maghama at a total cost of 203 million UM, an average cost of 50,000 UM (\$1,000) per hectare. A Peace Corps estimate in 1980 was US \$3,250 (162,500 UM) per hectare (Morrison, 1980), while another volunteer reckoned to have spent the same amount on an 850 m² pond.

Operating costs were assumed to be 22,500 UM/ha (\$450) per year by RAMS (p. 93) and 95,500 UM (\$1,900) by Morrison for a 6 month crop. Discussions with Peace Corps Volunteers on the Senegal side of the river indicate that only one crop per year can be expected; between November and March there was no growth amongst their fish, probably because temperature in the pond fell during these months to below that required for optimum feeding. Neither RAMS nor Morrison considered labor costs for maintenance, composting, feeding, water control, harvest and repairs. For RAMS, the major cost was water (89% = 20,000 UM) while for Morrison water was 12%, or 11,500 UM, and feed costs were 38%.

A realistic estimate, assuming no cost for family labor or for transportation as well as a whole series of technical conditions, might be as follows:

Water pumping cost	20,000 UM
Fertilizer 18/kg x 200 kg	3,600
20 year amortization of capital cost	8,125
Harvest labor	800
Small net, 60,000, 3 yrs.	20,000
Feed	30,000
Fish fry, 6,500 at 5 UM each	32,500
TOTAL	<u>115,025</u> UM/ha

In view of the costs, and the technical imponderables and risks, the same question must be raised as for inland fisheries: does it make sense to invest heavily in a high risk production technique which might provide a few tons of fish, when a near-shore, renewable marine fish resources of perhaps 40,000 tons per annum (Doucet 1981) exists along the coast?

Marine Artisanal Fisheries

Virtually all public international assistance efforts in fisheries are concentrated on the artisanal marine sector. However, most projects which have material donation components are stalled because of the poverty of institutional infrastructure in the Fisheries Department. There is neither staff nor structure within the fisheries ministry to receive, operate, or take responsibility for a donation of goods and/or services. Thus most projects, with the exception of the Japanese program, must be considered as "proposed development" even where funds have been committed.

The Japanese assistance program, now in its second phase, began in 1977 with the provision of fishing materials, boats and shore facilities. The total assistance package, which will run until 1984, has cost just under US\$7 million. This program has been exceptionally successful and is the basis for the development of a modern Mauritanian artisanal fishery to supply both internal markets and industrial processing plants. It started at just the right time, when the supply of riverine fish had dried up, the annual demand for 7,000 tons of fish could only be met from the sea, and there was no traditional marine fishery apart from the few isolated Imraguen villages. At Nouadhibou the fish processing industry was failing from lack of fish landings to supply the facilities.

The Japanese provided a fishing gear specialist and a mechanic both at Nouakchott and at Nouadhibou. They donated 40 motorized, fiberglass pirogues and 10 motor launches to the fishing cooperatives that they had established, as well as three insulated trucks to help maintain the quality of fish sold to the interior. They built a 20-ton cold store on the beach and a store house for equipment. The fishermen of Nouakchott fish primarily with handlines since the consumer market prefers bottom fish (bream, grouper, etc.), but the Japanese specialists introduced new methods at Nouadhibou to permit artisanal fishermen to enter the industrial export market. It is estimated that the Japanese assistance project has thus far increased the artisanal catch between two and five times (see II above).

The second Japanese aid program has provided 10 more launches to the Nouadhibou cooperative, 15 motorized fiberglass pirogues (inboard diesel)

to the Nouakchott cooperative, 17 diesel pirogues to the Imraguen north of Cape Timiris, and 10 diesel pirogues to Imraguen villages south of Cape Timiris. The original pirogue has been criticized as poorly designed, but the Japanese have gone through five prototypes and are confident that the 42 fiberglass boats meet all requirements for successful operation. In addition to the boats, a block ice plant (10 tons/day) has been completed at Nouakchott beach; four additional insulated trucks, with attached refrigeration units, have been donated for use in the distribution of fish to the interior, as well as 300 outboard engines for the existing pirogue fleet, 6,000 gill nets, 5,000 octopus pots, 2,000 fish boxes, a radio telephone set with generator for three land bases and/or 10 boats, and spare parts for all engines and equipment sufficient for at least two years. All are in Mauritania awaiting distribution. The packing crates have been used as house building materials for several hundred local residents.

The objective of the Japanese assistance is to stimulate mechanization and modernization of the artisanal marine fleet and to provide some initial training in fishing methods and for motor mechanics to permit the fleet to operate successfully. The Japanese have helped the Nouakchott cooperative to operate and maintain the cold store, and four mechanics were trained in its operation. The addition of an ice plant, boats' gear, etc., will require additional management and marketing capability in the cooperative that the Japanese are admittedly lacking. For the time being, the Japanese assistance has been accepted by the Ministry of Rural Development in the absence of sufficient support structure in the Ministry of Fisheries. The ONPP (Office National pour la Promotion de Pêche) was created in 1981 to administer and assist in the operation of such foreign aid projects, but it was dissolved in early 1982. Thus, there is no one to accept the Japanese aid and to provide training, management, cost of operation, and control for its proper utilization. The Japanese team has proposed that the fishing boats and outboard motors be sold to the fishermen at FOB Japan prices on a five-year payback at 7% interest, to provide a revolving fund for the purchase of additional equipment and spare parts. This must also await some management structure before being applied.

The FAO/UNDP has a two-pronged artisanal fisheries project. One technical specialist, a master fisherman, is teaching the Imraguens at Blawakh to use the Japanese donated equipment and is encouraging the sale of fish to Nouakchott using one of the insulated Japanese trucks. Production from four Imraguen villages is delivered to Nouakchott at the rate of six to seven tons each week. The second part of the project is boat building, and an FAO expert, together with three Mauritanian carpenters, is building a wood prototype motor sailer for use by the Imraguens. It was explained that this prototype will be later used as a template for fiberglass motor sailers.

It is difficult to determine the exact components of the Saudi Arabian artisanal fisheries development project, other than the planned provision of a workshop to make and repair pirogues, an outboard motor repair shop in Nouakchott, and the donation of fishing materials to the artisanal sector with a value of 36 million UM. No doubt the project has not been implemented because there is no one in government who could accept the gift on behalf of the fishermen.

The European Development Fund (FED) has four proposed projects, three of which have already committed funds under the European Community's 5th FED. These projects are stalled at the planning stage pending full cost-benefit analysis. The proposed components are as follows:

- Provision of three cold stores for fish from the artisanal marine fishery in three inland locations. This is designed to improve and increase fish distribution to interior markets. The cold stores will be managed by a private firm to be established and managed by the Fonds National pour le Developpement (FND). FED contribution is 229 million UM. The FND is unique in being one of the few (perhaps the only) technocracy in the GIRM. The 15 or so university educated economists, engineers etc. that staff the FND may be the beginnings of a stable bureaucracy that might move the country toward sustained development not currently possible given unstable ministries without professional support staff. The FND will still be able to support the traditional Moorish domination over resource distribution. In the case of the cold stores, the private firm established by FND will no doubt be Moor controlled. Control of the cold stores will permit Moorish domination over fish distribution to the 25-30 Soninke fish dealers in the Senegal River Basin.
- Supplying Imraguen villages with water and food. FED will contribute 45 million UM to provide better connection between the Imraguen villages and the more developed population centers. The villages have traditionally been totally dependent on outside assistance for delivery of water and all food apart from the mullet they catch. This project will alleviate some of the problems of Imraguen isolation.
- A credit program for artisanal marine fisheries. A fund of 90 million UM will be provided to enable fishermen to purchase boats and supplies with a guarantee from their cooperative. This fund is expected to be managed by the FND on behalf of the GIRM. The credit program will be in addition to the Central Bank's present provision of low interest credits to fishing companies, available through commercial banks. Before 1982, commercial bank loans to industrial fishing companies were made at normal banking terms. Credit granted in the 1970's was normally short-term (up to 2 years), and totalled 100-200 million UM per year (CEAO 1980, page A 50). Even industrial fisheries loans were considered a poor risk; no loans were made to artisanal fishermen.
- A planned 5 million UM study by FED on the marketing possibilities for Mauritanian fish in European markets is being held back for further consideration.
- Although no money has yet been committed, FED plans to provide funding for a marine training school at Noadhibou. The school would prepare Mauritanian fishermen for work aboard more sophisticated fishing vessels as well as for some of the more

responsible ship-board positions. A Higher Institute of Fisheries and Technology was proposed by CEAO in 1981 that would cost 350 million UM and be available to students from all member states of the West African Community.

- In pursuit of its New Fisheries Policy the GIRM has proposed the creation of a national fleet of modern artisanal fishing boats costing 1,236 million UM (January 1982 draft of the outline of the IV Development Plan). The White Fish Authority (WFA, 1980) recommended the introduction of six dual purpose trawlers (228 million UM) and twenty aluminum or GRP vessels for the artisanal fishery (33 million UM) as a contribution to this proposal. A project for the establishment and operation of an artisanal fleet was also proposed by CILSS (1977). Over 10 years, a fleet of 43 seiners/hand liners would be built, operated and managed by the project for 5 years. Total estimated cost was US\$8.5 million. To date no donors have been located for fleet development on this scale.

MPAT, 1981, listed the construction of a pier for artisanal boats in the Bay du Repos (374 million UM) and a Nouakchott centre for fishing materials and equipment. Neither project had any planned financing. The Bay du Repos has greater need for dredging than for a pier.

- Among other development proposals is a plan for an artisanal fisheries center which would include experimental stations for the following: solar energy production; uses of presently non-commercial fish species; fish preservation, and production of bio-gas from fish waste. The center would also include basic schooling for fishermen, workshops for teaching the use of hand tools, and installations for cleaning, preservation, and storage of fish. This proposal was prepared by E.G. Rudolphi, an artisanal fisheries advisor to the Directorate of Fisheries funded by the West German Government. Rudolphi has also proposed a mobile teaching project using slides and demonstrations for the use of fishing equipment, building boats, repairing motors, and treatment of fish.
- The White Fish Authority (1980) proposed projects to improve the artisanal fish landing facilities at Nouadhibou and at Cap Timiris. For the Bay du Repos--the present artisanal fisheries harbor at Charka, Nouadhibou--development of a quay was suggested for up to 150 small boats, comprising a small shore complex including freezer, cold store and ice plant; dredging of the Bay to permit better entry was also suggested. The capital investment would be 281 million UM, of which 73 million UM would be the cost of the processing complex.

The Bay du Repos needs dredging to provide for the safe mooring of the artisanal fleet, but this is not considered a national priority because shore facilities in Nouadhibou are quite sufficient. Most joint industrial fishery ventures intend to supply ice and assistance to the artisanal fleet and will continue to purchase their fish.

Cap Timiris is the largest Imraguen village and home of the fishermen's pre-cooperative. WFA proposed the conversion of the present dry fish preservation method to wet salting because of the better market. The proposed development would include a transport vessel for distribution of water and supplies to Timiris and carriage of salt fish back to Nouadhibou. Capital costs were estimated at 17 million UM.

The FAO Investment Centre sent a mission to Mauritania (Blanc, 1982) to identify the investment potential in artisanal fisheries. The mission report included many ongoing and planned projects:

- Water reservoirs for 7 Imraguen villages and a diesel launch for transport of drinking water (FED proposal).
- Boat building and credit for equipment and motors; training and a repair shop, an ice and fuel station at Nouakchott, a place to buy stores on credit (UNDP/FAO and FED).
- Practical training for the young and unemployed at Blawath.
- Installation of landing facilities and shore plant (WFA).
- Insulated vehicles for fish transport (Japan).
- Large chill store at Nouakchott beach (Japan).
- Fish markets in Nouakchott and six inland towns.
- Installation of cold stores in the interior (FED).
- Promotion of fresh fish and traditional artisanal products.

The total estimated cost of these projects was US\$ 8.6 million, half of which would be for the WFA landing and preservation facilities and the Japanese chill store at Nouakchott.

Industrial Marine Fisheries

The GIRM Plans to support its New Fisheries Policy by continuing its search for joint-venture fishing partners while progressively phasing out the old licensing system and via the creation at Nouadhibou of "services and conveniences indispensable to a large fishing port" (March, 1982 draft of the outline of the Fourth Development Plan: Orientations and Program of Action, page 8). Towards this end it has budgeted 3,100 million UM (of which 698 million, 22.5% would be internally financed) for various industrial fisheries projects. No donors were listed. In the December 1981 draft some of these projects were listed in more detail: repair facility for Nouadhibou (see below), buoyed approaches to Nouadhibou; marine radio stations for Nouadhibou (120 million UM) and Nouakchott (70 million UM); a fishing port for Nouakchott (4,500 million UM); and the development of support and management facilities such as a surveillance system, the national office for Fish Promotion and professional fisheries training at the Centre Mamadou Touré in Nouadhibou, the Lycée Technique in Nouakchott, and the planned professional Marine Training Centre (see below).

The White Fish Authority (1980) included in its recommendations for the implementation of the New Fisheries Policy the provision of supplementary fish handling equipment to break the unloading bottleneck at Nouadhibou, comprising maximum use of existing processing plants and the introduction of new plants in stages. This has actually begun to happen under the auspices of new joint ventures. Each processing plant is being built with its own unloading quay, and no doubt some will use the recommended fish boxes.

The WFA also recommended building a new fishing port at Nouakchott over 10 years and to include processing facilities to handle 152,000 tons of fish for freezing and for fish meal. The total cost would be between 4,400 and 6,700 million UM, depending on inflation rates. The proposed quay would be a built-up island offshore and to the south of the present Nouakchott wharf, connected to the mainland by a causeway. It is not clear whether the GIRM intends to use the new Chinese built wharf (still under construction) to unload some fish for processing. The fourth development plan lists the Chinese Port at 1,700 million UM, as well as repair to the Nouakchott wharf (130 million UM) to be financed by FED, but it does not include the WFA recommendation.

West Germany has plans to provide Mauritania with an improved surveillance system which would permit the Fisheries Department to keep track of fishing boats in its waters, to more effectively stop poaching and illegal fishing, and to begin to provide information on the quantities of fish captured for the collection of export duties and for proper management of the resource. West Germany will be installing a satellite navigation system and the equipment for a shore station and ship communications costing 1.2 million DM. The present surveillance system of one aircraft and four patrol boats is operated by the Military and it is assumed that they will provide the staff to operate the new system.

As mentioned earlier, the Fourth Development Plan established the need for a ship repair facility. The USSR had reportedly promised to build one as part of their contribution of the fishery, but they are said to have recanted, as is Rumania, which had offered one billion UM. Meanwhile, a federation of fishing companies (Federation des Industries et Armements de Pêche) has been formed in Nouadhibou to find financial support for such a facility.

The West African Economic Community (CEAO, 1980) proposed a Community company for fishing from Dakar and Nouadhibou and the marketing of fish in Abidjan and throughout West Africa. It was envisaged that in the first phase the company would buy seiners, a cargo vessel, freezers, etc. at a cost of 6,348 million CFA (US \$18.1 million) over 5-6 years. It was projected that the project would be financed by bank loans and member governments. It is unlikely that the CEAO governments will come together to form such a company or that the investment to produce 37,000 tons of frozen pelagic fish per annum is either warranted or economically sound. Nevertheless, there are opportunities to sell Mauritanian produced fish into the other CEAO countries.

CILSS (1977) proposed a fisheries development project with a US \$6 million cost over four years. The project would undertake a program of fish stock assessment and dynamics at the Nouadhibou laboratory and

establish a professional training centre in cooperation with the Mamadou Touré School for refrigeration operators, processing plant engineers and boat captains and engineers. It would include pilot development of 10-15m fishing vessels, a shipyard workshop, and the development of new export products and fishery management models for Mauritania. The budget showed 552 man months of experts worth \$2.6 million, construction of boats, labs, shipyard, an inland fisheries development station, etc. Such a plan appears overly ambitious and would prove impossible to administer. Nevertheless it contains the germ of perhaps a half dozen supportable projects.

IV. POLITICAL AND INSTITUTIONAL CONSTRAINTS FOR THE RATIONAL EXPLOITATION OF COMMERCIAL MARINE FISHERY RESOURCES

The White Fish Authority (1980) recommended the establishment of a single centralized fisheries management organization to operate all aspects of Mauritania's fishery. On this recommendation the Fisheries Promotion (ONPP) directorate was established in February 1981 to act as the GIRM representative in fisheries joint ventures partly owned by the State. They were to identify and execute fisheries projects, assist in control of the cooperatives and act as recipient for equipment and materials donated to the artisanal sector. The directorate appeared to have a complex structure in which the Director General was supervised by an administrative council composed of representatives from the Ministry of Finance, the Central Bank, equipment suppliers, etc. The Director himself was to be chosen by the Minister of Finance and was to be advised by a non-line "cabinet" for commerce and marketing, studies and projects, etc. A regional office in Nouadhibou was planned with both artisanal and industrial production and commercialization sectors. The ONPP was to have a staff of 54 and was to operate on a 47 million UM annual budget (Blanc, 1982). The agency was closed in July 1982 without public announcement.

The ONPP had potential access to vast sums of international money and to the formation of powerful political alliances. Fisheries is the sector where virtually all components of Mauritanian power have some dealings and where the centralization of control would be too tempting an opportunity not to build a political power base. It is perhaps for this reasons that the ONPP was established with so many checks to the power of the director general and why it could not be permitted to continue.

The dilemma of the GIRM is that it cannot hope successfully to manage its industrial fisheries sector unless someone is permitted to make long range economic decisions; yet it cannot permit anyone to hold such a powerful position which might upset the delicate political equilibrium of Government.

For the reasons outlined earlier, negotiations and the establishment of joint ventures in Mauritania are very difficult. The European community, for example, has been negotiating without success for four years and the Japanese, who began discussions with the GIRM in 1978 gave up negotiations and pulled out their fleet in August 1982. Rather than agree on single items of an agenda, the GIRM prefers to prepare an entire package for agreement, trading and bargaining each new point against the total package of concessions and promises. It is not often clear to Western industrial nations that every law, decree, and statute is negotiable^{1/}--

^{1/} Libya for example, in return for fully capitalizing the joint venture and renovating the huge IMAPEC processing facility, which is expected to employ 900, has very wide powers to catch all types of fish in unlimited quantity, build and develop land based ventures, and is not liable for registration fees, import or export taxes, transport or fishing permits. Mauritania is to pay its 50% of the share value from profits of the joint company over 20 years. (CEAC, 1980, Appendix, page A 100.)

often with individual sources of power (political, military, police, customs, finance, etc.). Further difficulties arise owing to the instability of the power bases. Since 1977 the Minister of Fisheries has changed eight times. The position gives access to enormous sums of international money as well as to powerful political alliances that could be a threat to other power centers.

Even after negotiations are completed, further concessions on any aspects of the agreement may be demanded. Most agreements are continually renegotiated privately with various power bases; opportunities for short-term profits are often available to leaders in the political, military, police, customs, etc. sectors who have the power to completely halt the operation of a business. That is not to say that fishing companies always act in good faith. MAUSSOV, SIMAR, and COMAR, the Eastern European fishing ventures, are said not to have complied with the joint venture agreements to build shore facilities or to land all fish in Mauritania. They are doubtless greatly under-reporting their catches to avoid export duty payments, and it is doubtful whether they are employing the required numbers of Mauritanian crew. Mauritania has received far less from its joint venture agreements with these fleets than it did when it was licensing their fishing boats, and national control over the fishery appears to be minimal. (It was not possible to learn the identities of the private Mauritanian shareholders in 9% of MAUSSOV, 36% of SIMAR, and 51% of COMAR.)

Another problem with the NFP is the non-competitiveness of Nouadhibou as an international fishing port with Las Palmas in the Canaries. Processing costs at Nouadhibou are high: power costs 11-13 UM/kwh; labour is expensive and not very productive because of excess capacity; fixed costs are high; catch per boat day has decreased owing to overfishing. Export duties are 8-18% of unrealistic and inflated market prices.

Nouadhibou is isolated from its markets by minimal banking facilities, poor communications networks, and limited access to transport. There are no ships stores, spare parts, ship repair facilities, or mechanical services, or amenities for officers and crew.

It would hardly make economic sense to force further processing capacity on an already over-extended industry which might require government subsidization of infrastructure, and perhaps even of processing costs, just to break even. In pursuing its NFP the GIRM has entered into a long series of financial risks and economic responsibilities, including international joint ventures, and established the necessity for public investment in support infrastructure which has no possibility of providing the financial rate of return of the old licensing system. Doucet (1981) presented an economically rational argument for retaining the licensing system while slowly improving the Mauritanian owned fishery. The White Fish Authority (1980) recommendations, on which much of the present development rests, were hesitant about the establishment of massive long-term commitments such as have been negotiated by the GIRM in the past two years. WFA recommended retention of a licensing system while permitting controlled growth of joint ventures within a safe exploitation rate of fish stocks.

Another major limitation to the economically sound development of the annual 600,000 ton marine fisheries resource, both artisanal and industrial, is the instability and lack of government infrastructure which could support artisanal fisheries development and encourage private investment in the industrial sector. The resource needs proper management for sustainability and requires institutional management for effective use of proffered donations to the artisanal fisheries sector.

The Ministry of Fisheries and Marine Economy is highly unstable and has virtually no technical or administrative bureaucracy to support fisheries development, stock management, or administration of the New Fisheries policy. Below the level of the frequently changing Minister and his personal entourage there is no support infrastructure for fisheries. This is an enormous hindrance to the acceptance and administration of fisheries assistance projects and the distribution of fishing equipment and services to the artisanal sector. It prevents the GIRM from performing its role as partner in the fisheries joint ventures as regards policy, management, control, or profitability.

The Ministry of Fisheries and Marine Economy in its present form was established in November 1980 with the structure shown in Figure 1.

The directorate of fisheries is responsible for the management of the resources, the promotion and development of artisanal and industrial fishing including cooperatives, and the control of fishing. That is, it is in theory responsible both for promoting and for policing the fishing industry. This is counter-productive. The police function tends to discourage fishermen from cooperating with the provision of statistically useful data for fisheries management and makes them wary of any efforts by the department to help in development. RAMS (SS-6) reported that the artisanal (traditional) fisheries division had, in 1980, five Japanese and two UNDP artisanal fisheries experts seconded to the marine section. The inland fisheries section was reported to have no staff.

All four professionals in the directorate of fisheries were trained at USSR Universities for four to six years. This has given them a bias toward centralized planning. The West German government has provided an adviser who is primarily concerned with artisanal fisheries development. He has suggested training programs and improvement of the surveillance system.

The Oceanographic and Fisheries Research Directorate is responsible for all research and the inspection and control of fisheries products and sanitation. It also looks into new technologies for fishing and processing. The directorate is centered at the Research Laboratory in Nouadhibou which has been in operation for more than ten years and presently publishes a bi-annual journal. It is currently staffed by six ORSTOM biologists and two USSR oceanographers, together with Mauritanian counterparts.

Although Statistics are published and recommendations promulgated through its journal, the Centre National de Recherches Oceanographiques et des Pêches appears to have neither authority nor access to authority with management responsibility for fishing.

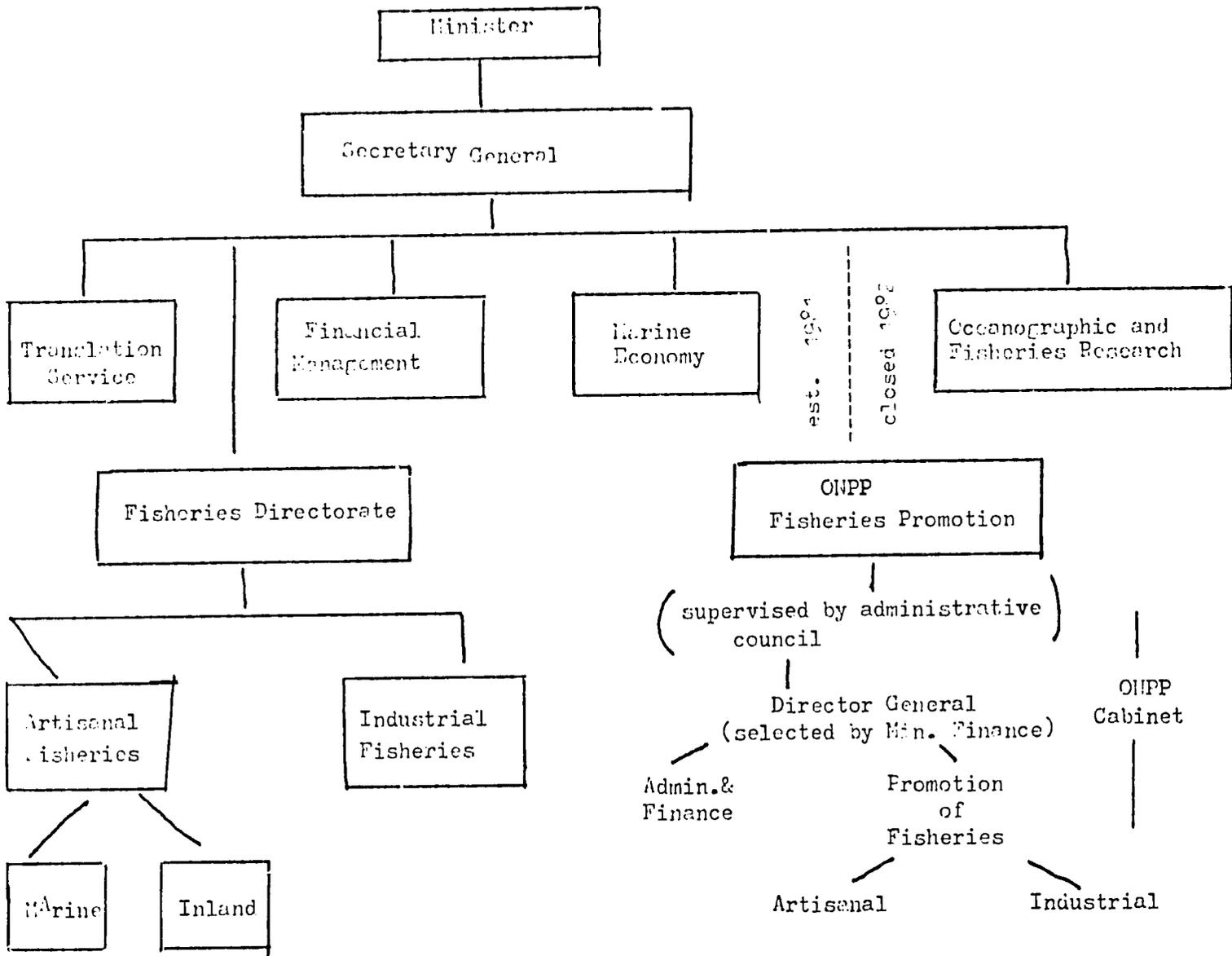


Figure 1. Ministry of Fisheries and Marine Economy

To date, fisheries training has been on two levels: practical training for work aboard fishing boats or ancillary industries, and academic training for management positions.

The Mamadou Touré School in Nouadhibou had, until 1979, a short course to train deck hands for the fishing industry. The course was said to be too short and too general and only provided one-half day aboard a boat before graduation. Of the nearly 1,000 deck hands that passed through the school's program, only a few hundred may actually be working on fishing vessels. The Mamadou Touré School has a variety of mechanical courses useful for processing-plant workers.

The Lycée Technique in Nouakchott also provides technical courses useful for fisheries workers but has no course in diesel mechanics essential for the fishing sector.

Several nations fishing in Mauritanian waters provide scholarships to Mauritanians to study abroad. Algeria presently has 20 students learning to be captains, engineers, and fishing gear specialists. Prior to 1980, Spain provided scholarships. The Eastern European countries are also training fisheries personnel. The Japanese have trained four mechanics to operate the cooperative cold store and have run basic short courses on the operation of the diesel engines and outboard motors they supplied.

The CEAO has proposed an "Institut Supérieur des Sciences et Techniques Halieutiques" for training fisheries personnel, and a World Bank/FED project for the "Centre de Formation Maritime Professionnelle" will reportedly be funded in 1983.

At the professional level it is not clear how large a reservoir of adequately trained fisheries managers exist or even how many of those who have been trained would be available for a national fisheries development effort. At the technician level there is a lack of diesel mechanics, freezer plant operators and service personnel, and responsible fishing vessel staff (captains, engineers, mates, gear specialists).

In summary, what Mauritania lacks for the development of its fishery--besides economically more rational policies--is information about fisheries, people who can receive and use that information, and an institutional structure within which those people could contribute to the management of the resource and the consequent maximization of revenue to the nation. Physical infrastructure, such as surveillance systems, processing plants and piers, is only useful to the extent that managers know how to make it so.

V. CONDITIONS FOR A FEASIBLE MAURITANIAN ROLE IN COMMERCIAL MARINE FISHING

To turn the present NFP into a policy that would yield the greatest financial return to the nation will require a change in attitude, a break from the Moorish tradition, and a modification of the highly acclaimed New Fisheries Policy to limit fishing effort and minimize the establishment of new joint ventures. The plan for maximizing revenue from a fishery is straightforward and well known, but its implementation would call for a change of GIRM's attitude toward its resources, and of the world view of the Mauritanian power structure.

If Mauritania wishes to establish a financially viable fishing industry in its waters, the following steps could be taken:

1. A multi-species stock assessment should be made to provide information on the dynamics, distribution, and population levels of the target fish species and the inter-relationship among the species. Fish stocks undergo considerable natural fluctuation in abundance and distribution and species interactions may be important in determining population levels of some stocks.

Catch per unit effort data, size composition of fish, etc. would be collected over perhaps 14 months, during which time Mauritanian fisheries officers and technicians would be trained in fisheries stock assessment. In later years, continuous assessments can be made by fisheries officers placed on vessels of the fishing fleet to gather data.

2. The biological data would be analyzed and conclusions drawn as to the size, age composition and exploitability of each stock. These biological conclusions would then be translated into economic terms, i.e. levels of fishing permitted, types of vessels and shore facilities needed, patterns of control required, etc.
3. Fisheries legislation would be written to provide the power and sanctions for operating the fishery, and an institutional infrastructure established to administer and manage the fishery policy. Due to the dynamic nature of fish stocks, especially when being harvested by a fishery, a certain flexibility is required to permit adjustment in fishing effort on an annual basis to maintain levels of maximum profitability (i.e. maximum catch per unit of effort and of cost).
4. The establishment of an institutional infrastructure of fisheries managers, biologists, lawyers, economists and other specialists would require a broad range of training at the university post graduate level. There is no real indication as to how many of the more than 2,700 Mauritians presently studying abroad will return as qualified fishery specialists. Presently there is no institutional structure that can support

more than perhaps six specialists (the CNROP in Nouadhibou, and the Fisheries Department currently with four professionals). This would be expanded to provide sufficient management and data collection capability to permit annual re-evaluation of fishing effort, and decision-making for its implementation. The size and quality of fisheries management in Mauritania should be consistent with the fact that it is the country's largest renewable natural resource and could be worth more than \$30 million per annum in revenue to the GIRM on a gross turnover of about \$300 million.

5. The development of a long-term program of fisheries management will require support systems for research, enforcement and inspection, administration and marketing.

The most expensive aspect of this institutional support will be policing. The detection of poachers, or other vessels fishing illegally, by airplane, the verification of vessel activities and inspection by patrol boats, arrests and adjudication, etc. are usually in the hands of the Military. There are plentiful opportunities for misuse of power, blackmail and corruption in a surveillance system; thus, careful planning must be done to assure the most effective use of the system. The German government will be supplying a satellite navigation system and a USNMFS specialist (Perry Allen) has provided the outline of a surveillance system to USAID.

6. Having already made a commitment to on-shore processing at Nouadhibou, the GIRM is under some obligation to provide supporting infrastructure for its joint-venture partners. Most critical are improved communication systems, low cost electric power, and the encouragement of regular airline and ship transport schedules. Roads to Nouakchott or connecting to international marketing routes and subsidies of internal air fares would help to free Nouadhibou from its isolation. A ship repair facility would save valuable foreign exchange.
7. The export tax system is not presently providing the maximum possible revenue to the State. Under-declaration of fish captured and frozen on board, special permits to land fish abroad, corrupt tax collectors, and privately negotiated tax rates all limit government revenues. In an effort to stop some of this leakage, the GIRM decreed that ALL fish captured in the Mauritanian EEZ Must be landed at Nouadhibou. This is not a totally effective policy either, since the double handling and increased transshipment cost of fish presently being transshipped at sea adds significantly to low value pelagic fish. A far better method would be to tax fishing effort but this is precisely what the licensing fee did prior to the NFP of 1979. The point of the NFP was to improve control over joint venture partners and increase revenue by imposing landings and processing the financial return to the fishing fleet and consequently most of the fleet has ignored the terms of the NFP.

It is far better to permit the fishing fleet to maximize profits and to set license fees at the highest proportion of that profit (calculated from the known fishing power of the fleet, the population of fish, and world market prices) that the fishing fleet can bear.

8. The GIRM has made commitments to joint venture fishing companies but does not participate in the management of these companies. Generally one person from the Ministry of Fisheries is assigned to the board of the joint venture and meets once a year with the board. The GIRM should take a more active and public role in its joint venture participation.

The FAO Technical Cooperation Program (Doucet, 1981) criticized the New Policy because it would fail to maximize the possible financial returns and place Mauritania at financial risk for smaller return than under the old licensing system. The FAO suggested a slower Mauritanianization of the fleet through joint ventures while retaining the licensing system. They suggested that a more rational approach might permit the fishing fleet to maximize their profitability by not landing all their catch at Nouadhibou, and by making more efficient use of existing processing plants before building new ones. A substantial reinforcement of fisheries administrative capacity for surveillance, research, and fisheries management was suggested.

This document has apparently been buried by the GIRM, no doubt because of its criticism of the New Fisheries Policy which the Government seems intent on pursuing at any cost.

VI. SOME PROPOSALS FOR POSSIBLE USAID INVOLVEMENT IN THE FISHERIES SECTOR

There would be little argument about the preferred strategy for the development of Mauritania's enormous fisheries potential if it were agreed that the resource were to be developed for economic ends. An assessment of fish stocks, their biology and population dynamics would be made with a provision for continuous monitoring by trained Mauritanian nationals. Policy would be set to exploit the fish stocks at a rate consistent with the highest sustainable economic yield. Fishery legislation would be put in place and a strong Mauritanian institutional infrastructure would be established to carry out the plan.

The tools of surveillance and inspection, data collection and statistics, and the power of the law would be used to protect, administer and manage the fishery with the intelligence and flexibility required by the continuous fluctuations in abundance and distribution of fish stocks. Fishing fleets would be invited to harvest the resource on a controlled basis either by license or by joint venture in a specific fishing effort; agreements would be reviewed annually on the basis of analyses of stocks from the statistics generated throughout the year. Yields would be controlled to protect both the stocks of fish and the maximum profitability of fishing companies to permit the maximum financial return to the GIRM on a sustained basis.

Given such a policy and institutional environment, there could be a role for USAID involvement in marine fisheries development in ways that would supplement or complement the assistance efforts currently being implemented or firmly committed by other donors. From an economic point of view, appropriately utilized assistance to this sector would tend to have the highest payoff of any imaginable investment in Mauritanian development--indeed it may well be the only sector in which such investment would really pay off.

The following projects are listed in decreasing order of suitability for AID participation by reason of the peculiar mix of political considerations, economic viability and general usefulness of each.

1. Ship Repair Facility (chantier de reparations navales).

Presently all fishing boats based at Nouadhibou must go to Las Palmas or Dakar for repairs or refitting. The GIRM has requested a ship repair facility at Nouadhibou and both the Russians and Rumanians had promised to establish one--perhaps in lieu of processing facilities required under the terms of the respective joint venture agreements--and have subsequently reneged. A federation of fishing companies, under the leadership of SOFRIMA (a wholly owned Mauritanian company) has been formed to seek financing for a ship repair facility.

A USAID sponsored joint venture with the U.S. private sector and Mauritanian participation by the FND (25%) and the Federation (26%) could perhaps meet all the political and economic terms of reference required

for a successful project. A repair yard should have a reasonable financial rate of return. The US partner would provide the turn-key facility, technical management, and training for shipwrights, welders, diesel mechanics, etc. The advantages of this project are considered unique in the high risk fisheries sector.

The GIRM has budgeted 1,000 million UM (\$20 million) for a ship repair facility but this is no doubt an overestimate. A full economic feasibility study should be done to provide actual costs of the proposed project.

2. Artisanal Fisheries Cooperative Management and Fish Export Marketing.

The artisanal fishery is a "safe" sector; production is small, the target group tend to be either black or poor or both, and neither sufficient power nor money is at stake to involve the project in politics and/or corruption. The Japanese have, virtually single-handedly, developed the artisanal marine fishery, but continued expansion of the fish catch is now limited by marketing and cooperative management constraints.

By providing two cooperative managers (for Nouadhibou and for Nouakchott) and one marketing specialist to assist the cooperatives in marketing fish to other West African Community (CEAO) nations, USAID might become associated with perhaps the most successful project in Mauritania.

3. Manpower Development Program

If USAID were prepared to gamble on a future change in policy to permit the economically, rational exploitation of Mauritania's fisheries, a manpower development program could develop a reservoir of trained fisheries managers to provide the technical base necessary for long term development of fisheries institutions and programs.

There is legitimate question as to the ability of such a trained cadre to actually influence a change of policy in the short run. However, they should certainly be prepared to implement policy in the longer run once (and if) the change comes about. In the worst case, the fisheries graduates might strengthen the profitability of the private commercial fishery which is growing in Mauritania.

Such a program would entail the development of a graduate course of study for selected fisheries graduates, most conveniently in the French language, to provide them with specific tools to:

- a) teach technicians to properly collect relevant data;
- b) analyze these data to their biological conclusions;
- c) translate these conclusions into economic terms so that management decisions could be made on levels of fish exploitation.

The University of Rhode Island is known to have a program in marine fisheries available to USAID recipient groups. It must be made quite clear that the program to be developed would be for commercial industrial fisheries, and NOT for artisanal fisheries.

A critical part of the program would be the donation by USAID of a marine survey, perhaps during the third and fourth year of the development plan. This survey would provide at least 14 months of ship-time to assess the target fish stocks, their population, age structure, and dynamics, and the present unit effort catch with the various gear in present use. After at least 14 months of data collection the Mauritanian fisheries managers and their USAID specialist counterparts would then prepare an economic plan for fish exploitation by Mauritania.

Only if an actual assessment and an economically sound plan for development of the fisheries will have been prepared by a trained Mauritanian cadre of fisheries specialists would they have any chance at all of being accepted by the GIRM. A total national package, i.e. a Mauritanian group with a Mauritanian plan, may be plugged into the GIRM administration as the management team for the New Fisheries Policy. The team and its package would have decided advantages for the GIRM. It would promise increased revenue to the GIRM and provide increased Mauritanian control of the foreign fleet.

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