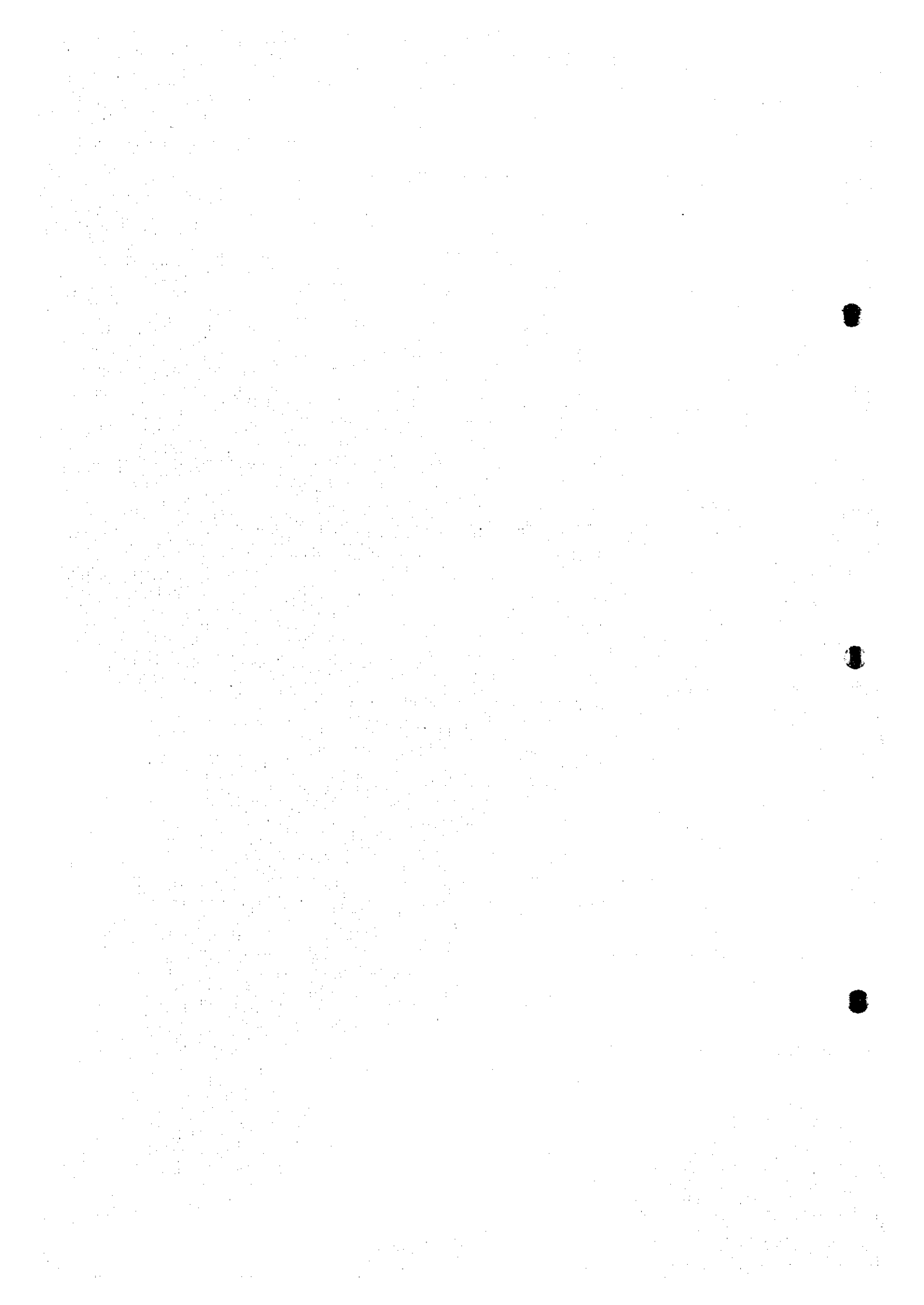
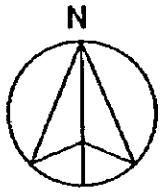


Tafedna

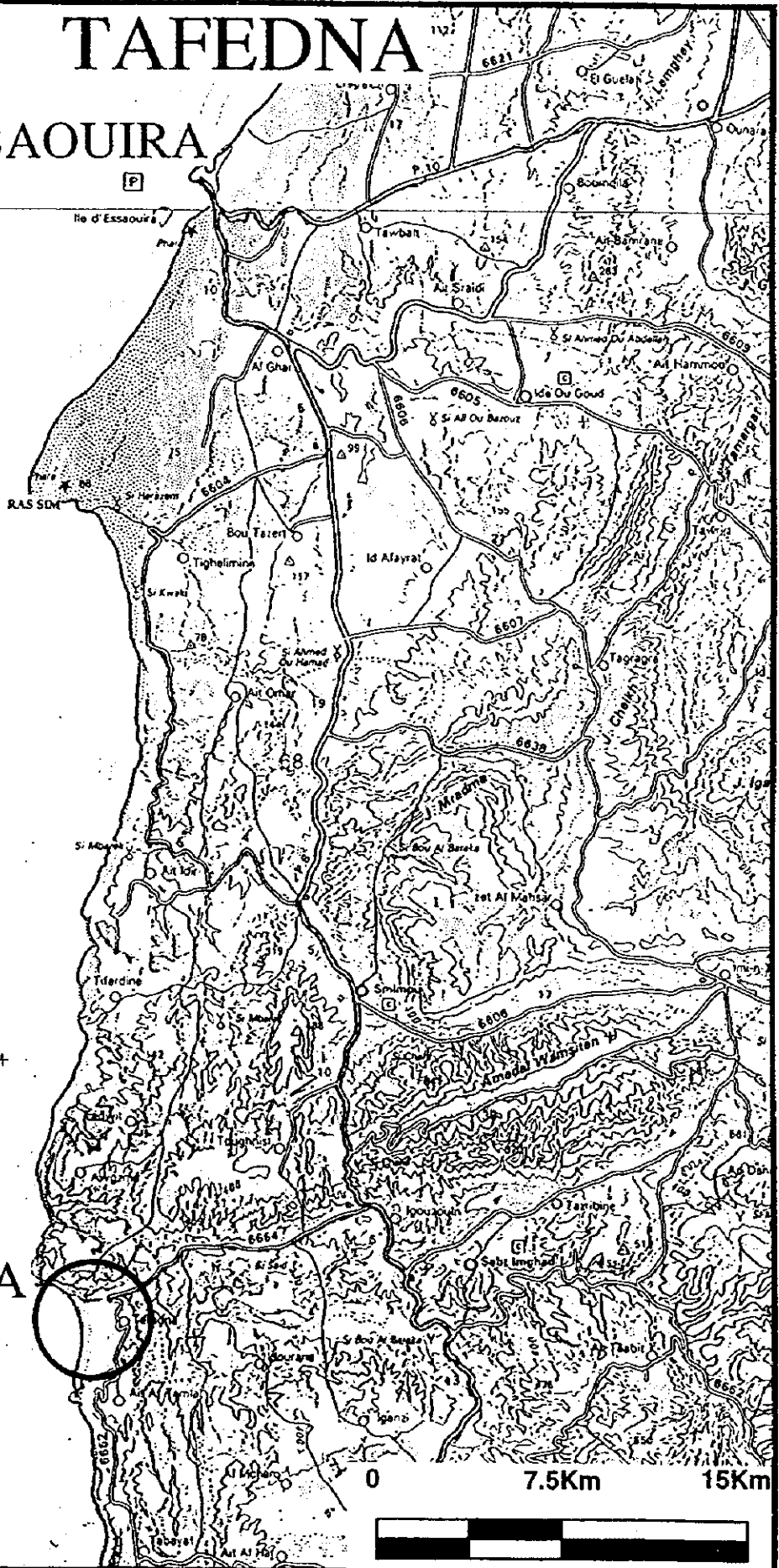




TAFEDNA

ESSAOUIRA

TAFEDNA



C. Tafedna

1. General conditions of the site

This site is a sandy beach on the Atlantic Ocean. The beach is formed at the edge of an alluvial fan surrounded by rocky stretches. The estimated population of artisanal fishermen basing in Tafedna is less than 400, and that of their families is about 2,000¹. Most of these artisanal fishermen live in the commune rurale including Tafedna, but some come from other adjacent commune rurales. The population of the residents in the whole commune rurale is about 5,000². Agriculture is also practiced in the commune rurale, but the income of the residents is largely dependent on fishing. Like Suira Kedima, fishing methods which are most popular in this site are bottom longline and trammel net. They catch European conger, sea bream (*Pagellus spp.*), spiny lobsters and European lobster. A part of fishermen move south in search of better fishing places for squids from June to November. Their income standard seems to be at the same level as that in Suira Kedima.

1) Fisheries

(1) Overview

Tafedna consists of a sand beach coastline and alluvial fan. Coastal waters are served by an abundant supply of nutrient salts that flow from the mouth of the river which runs immediately south of Tafedna and these are agitated by coastal upwelling (exchange of bed and surface water) to create highly productive fishing grounds. Moreover, the Canary Current (cold current) which flows southward close by the coast gives great variation to the types of fish and shellfish that can be found here.

Essaouira, the capital of Essaouira Province, is located some 60 km to the north and Agadir, the largest fishing port in Morocco, is some 120 km to the south.

Parts of the fishing grounds currently worked by artisanal fishermen are shared with fishermen from other villages and ports and all fishing grounds are exploited to some extent or other. In particular, coastal fishery trawlers compete with artisanal fishermen in working the sandy bed fishing grounds that are located close to the Tafedna coast. Having said that, judging from the current quantity of catches, size of fish, forms of operation and scale of fishing gear, fisheries in Tafedna is considered to be more or less in a perfectly sound state.

(2) Number of Fishing Boats

According to surveys made by the local design consultant CID (Conseil, Ingenierie et Developpement) and MPM, the number of fishing boats based at Tafedna is put at 140 and 150 respectively. In this study, 50 fishing boats were confirmed in February and 80 in September. In interviews conducted with local fishermen, it was said that between 110 and 120 fishing boats operate from here during the summer high season. It is estimated that 50 fishing boats operate here in winter and that this number increases to around 120 boats in summer when fishermen from Essaouira and other fishing ports move in. It was also found that around 20 fishing boats from Tafedna move south to Tigret during the squid fishing season in summer (June to August).

Fishing boats in Tafedna, referred to as 'toukzart' or 'tourti', are small wooden boats measuring approximately 5.2 m in length and weighing around two tons. All the boats are fitted with outboard engines with an output of mostly 10-15 HP.

¹ These figures are calculated based on the site researches.

² From "Population Legale du Maroc, 1994, Direction de la Statistique, Maroc".

Kauoki in the north to Imessouane in the south. The main fishing grounds are directly west of Tafedna where the bed is rocky but in winter, when the sea soon becomes very rough, fishing grounds along the coast are worked. Fishing grounds in the north are shared with fishermen from Essaouira and those in the south are shared with fishermen from Imessouane. The grounds are located not more than 20 nautical miles from the coast and can be reached by fishing boats in less than three hours.

In the fishing grounds where the bed is rocky, scorpion fish, blue whiting, dentex, red pandora (*Pagellus* sp.) and conger are caught, while in the coastal fishing grounds where the bed is sandy, sole, European hake, European sea bass (trawling) and squid (jig) are caught. In particular, squid, which approach the coast in summer and are easy to fish, fetch a high price as an export commodity and are a good fisheries resource. It appears that trawlers are also illegally operating in these coastal fishing grounds, as a result causing damage to the fishing gear of local fishermen.

Fishing methods include bottom long line fishing, trammel net fishing, hand line fishing, trap fishing and jig fishing, and fishermen use such methods in different combinations depending on the season and fishing conditions. Some fishermen make two or even three fishing trips per day.

The following paragraphs describe operating patterns in the case of the main fishing methods.

In the case of bottom long line fishing, preparation of bait, which consists of sardine and squid, starts from the evening. Fishermen in Tafedna leave for sea at around 2.00 a.m. and arrive at the target fishing grounds in approximately two or three hours. Offshore fishing grounds where the bed is rocky are usually worked, but coastal fishing grounds where the bed is sandy are sometimes worked on days following stormy seas.

Mono-filament lines possessing from 1,000 to 1,500 hooks are thrown into the water and left idle until sunup. Usually, boats finish hauling in their lines by 10.00 a.m. and return home to sell their catches by 1.00 p.m. The main types of fish caught in this way are conger, dentex, scorpion fish, forkhead and gurnard.

In the survey that was conducted in September, some fishing boats were seen struggling to make fishing trips because of trouble obtaining sardine bait and a shortage of fuel.

In the case of trammel net fishing, most fishing boats leave for sea in the early morning between 4.00 and 6.00 a.m. and arrive at the target fishing grounds in one or two hours. The three units of net, each of which measures approximately 400 m, are already left in place in the water and are hauled in together with their catches. Once the catch has been removed, the nets are once again placed in the water. The operating methods adopted differ according to the types of fish aimed for: in the case of sea bream (*Diplodus spp.*), European sea bass, sole and squid, the nets are checked every day, but in the case of spiny lobsters and European lobster, the nets are left for three days at a time. Spiny lobsters, which come to feed on fish that are caught in the nets, are entangled. Most boats return home between 11.00 a.m. and 12.00 noon. Spiny lobster and European lobster are traded in the live state. Other fish caught in this way are serran, conger and gurnard.

The common pattern in the case of gillnet fishing is for fishing boats to leave for sea at 6.00 a.m., arrive at the target fishing grounds by 7.00 a.m. and return home by around 11.00 a.m.

Spiny lobsters and European lobster are caught in traps, apparently in fishing grounds that are located in shallow water close to shore. Trap fishing is performed in combination with jig fishing and hand line fishing, and fish caught in this way are sea bream (*Sparus spp.*), sole and capella.

Fishing for squid by jig is carried out in areas adjoining the target fishing village. Fishermen go out to sea every day during the high season and combine this fishing method with other methods. Trolling and bait angling for european sea bass, conger and dentex are also widely carried out.

See the appendix on fisheries in Tafedna for more information on daily operating patterns.

(5) Quantity and Value of Landed Fish

Table 1 indicates data collected in the September survey showing the average quantity and value of fish landed per fishing trip according to each fishing method. The unit prices of each fish type are shown in Table 2.

Table 5-3-C-1 Average Quantity and Value of Fish by Fishing Method

Fishing Method (Sample Number)	Bottom Long Line		Trammel Net		Gillnet		Jig		Overall	
	Weight (kg)	Value (DH)	Weight (kg)	Value (DH)	Weight (kg)	Value (DH)	Weight (kg)	Value (DH)	Weight (kg)	Value (DH)
September interview survey	193.8	2,511.4	50.8	960	76.1	945.1	61.4	1,524.9	137.5	2,091.6
Sample number	59		6		7		30		114	
September observation survey	78.9	1,196.8	28.3	895					44	988.4
Sample number	13		29						42	
Weighted average	177.2	2,274.0	32.2	906.1	76.1	945.1	61.4	1,524.9	112.3	1,794.8

Note) The reason why figures given under the interview survey are so large is because fishermen made more than one fishing trip per day during the week.

Table 5-3-C-2 Unit Prices of Major Fish Landed at Tafedna

Fish Type	Most Common Price (DH/kg)	Price Range (DH/kg)
Triggerfish sp., gray triggerfish	10	10
Red pandora (<i>Pagellus sp.</i>)	10	10
European conger	10	8-10
Sea bream (<i>Sparus spp.</i>)	80	80
European lobster	120	100-130
Spiny lobsters	240	230-250
European sea bass	100	90-110
Blue whiting	15	10-15
Sea bream (<i>Pagellus spp.</i>)	60	40-70
Octopus	35	35-40
Rockfish	40	35-40
Gurnard	35	30-35
Red mullet	20	20-50
Sea bream (<i>Diplodus spp./Diplodus bellotii</i>)	25	10-35
John dory	25	35

With regard to the annual quantity and value of fish landed at Tafedna, estimation is based on data obtained in the September survey indicating daily quantity and value of fish landed by one fishing boat as 112 kg and DH 1,795, respectively. Below is given an estimate of the annual landed quantity and value calculated from the total number of fishing boat trips obtained from the monthly number of possible operating days and operating fishing boats.

Annual landed quantity = 112 kg x 12,520 = 1,402,240 kg = approx. 1,402 tons

Annual landed value = 1,795 DH x 12,520 = 22,473,400 DH

(6) Fisheries Balance

Table 3 gives a trial calculation of the annual income of one artisanal fishing boat based on the assumption that the fishing boat conducts fishing on 120 days or 75% of the current annual number of possible operating days (160 days). The annual income per fisherman, calculated by simply dividing the profit following subtraction of expenses by the number of fishermen, works out to be roughly 52,000 DH (approximately US \$ 5,600) (US \$ 1 = 9.25 DH). As the average size of a fisherman's family is 6 members, the cash income per family member comes to a little less than \$1,000. No consideration is given here to fishing boat damage, engine or fishing gear loss, injury or loss of life arising from unforeseen accidents and it is also necessary to take into account income made by other family members, however, fishermen's households are practically self-sufficient in food and are not thought to be so poor that they are on the brink of poverty.

Table 5-3-C-3 Trial Calculation of the Balance of a Fisherman Household (Unit : DH)

Revenue /Day	Revenue /Year	Annual Fuel and Bait Cost	Annual Fishing Gear Maintenance Cost	Fishing Gear Depreciation	Hull and Engine Maintenance Cost	Hull and Engine Depreciation	Profit	Profit per Fisherman
1,795	215,400	22,950	2,557.5	25,575	4,000	4,000	156,315	52,105.8

Note) In reality, the share of profits received by the ship owner and captain differs from that of the crew, and this ratio differs again depending on the fishing method.

Trial calculation criteria:

Assuming that outboard engines are operated four hours per day, they consume 40 liters of fuel costing 2.5 DH/liter. The cost of bait is assumed to be 15 DH per day for hand line fishing and 300 DH per day for bottom long line fishing.

Gillnets and trammel nets (three nets per set) are assumed to cost 15,000 DH, have a service life of six months and incur an annual repair cost of 10% the purchase cost. Fishing boats are assumed to cost 20,000 DH, have a service life of 20 years and incur an annual maintenance cost of approximately 10% the purchase cost. Depreciation is obtained by dividing the cost by the number of useful years (service life). Engines are assumed to cost 18,000 DH, have a service life of six years and incur the same maintenance and depreciation costs as described for fishing boats. Concerning trammel nets, two operating patterns were assumed in the investigation: in the first, two sets are used to operate for two out of three days, and in the second, trammel nets are used in combination with bottom long line, the former being used for one day and the latter for two days out of every three.

2) Fisheries and Social Infrastructure

The project site is located on the north side of the alluvial fan which is to the south of Tafedna Peninsula some 30 km south from Essaouira. Fishermen live in communities that are scattered widely inland up to 10 km from the beach and they actively carry out agriculture in addition to fisheries activities.

A sand beach located in front of fishermen's lockers, which were constructed by the commune, is the main landing area. The fishermen's lockers contain a canteen, general store and commune branch office and act as a support center for fisheries activities. Fishermen sometimes stay overnight in the lockers and sometimes return home after fishing trips, and in summer a resort house annexed to the lockers is sometimes used by tourists. Fuel (tax-free fuel) is carried to the site from Essaouira by agents, and in summer ice is sometimes carried in from Agadir.

Access to the site is provided by a branch road of approximately 17 km which connects the site to the main

road that runs between Essaouira and Agadir. The road surface has simple paving, but there are places where the subgrade has been washed away as a result of torrential rains that fell a few years ago. Temporary measures make the road passable for small vehicles, but there is always the risk that heavy rain might cause the road to give way.

Concerning water supply, water from an irrigation well that was excavated in 1992 in the river basin upstream of the alluvial fan is pumped by private generator to an elevated tank behind the lockers, from where it is then fed to faucets. As it is said that 400 liters per minute can be pumped from the well, there is an ample water supply.

Concerning electricity, a 22 KV high tension power line runs along the main road, however, this does not lead into the project site. Moreover, since Tafedna is not included in the PERG that was formulated in 1996, there is no likelihood of the area receiving electricity supply in the near future. According to the Direction d'Électrification Rurale de l'ONE the cost of connecting the main power line to the project site would amount to approximately 35 million yen.

The only public facility in Tafedna is a clinic which is run jointly by the Ministry of Welfare and commune rurale and is within walking distance on high ground and a primary school located in the upstream part of the alluvial fan. Except for these, local inhabitants need to travel to Tamanar to receive other services.

3) Fishing Village Society Fishermen's Households and Housing

(1) Composition of Fishermen's Households

The average number of family members per household is 6.2, breaking down equally into 3.1 male family members and 3.1 female family members.

Table 5-3-C-4 Average Household Composition

Tafedna	Male	Female	Total
	3.1	3.1	6.2

(2) Form of Housing

The basic building styles of houses are the same as those seen in Souira Kedima, however, clay buildings account for roughly half of all houses. The average area of houses is 141 m², which is more or less the mid-point figure among house areas in all the target fishing villages. Incidentally, houses in this area also contain small frontal vegetable gardens, livestock sheds and central courtyards. The average distance from houses to the beach is 2.8 km, which is relatively short compared to in the other target fishing villages.

Table 5-3-C-5 Form of Housing

	House Building Style (Number of Houses)	Distance from House to Beach (km)	Number of Rooms	House Ownership (Number of People)	House Area (m ²)	Water Supply
Tafedna	Ordinary building 14	2.79	3.4	Own home 23	141.1	Water supply 1 Well, etc. 25
	Clay building 12			Rented 0		
	Barrack			Free 0 Parent's home 3		

(3) Fuel

Firewood is used by at least 80% of households. None of the respondents said that they purchase firewood, but it is almost always gathered from nearby woods, mainly by adult women.

Table 5-3-C-6 Energy Use

	Electrification Yes/No	Butane Gas Use			Firewood Purchase in Winter	
		Yes/No	Small Bottle	Large Bottle	Weight (kg)	Purchasing Households
Tafedna	Yes 2	Using households Average number of users	17	26	171	All 0
	No 24	Number of bottles Total household average Number of bottles	13.18 862	31.81		Half 0 Few 0 None at all 25
Firewood Use						
	Yes/No	Purpose of Use (Households)	Source (Households)	Firewood Gatherers	Gathering Site	
	25	Cooking 24	Cutting 0	Adult males 6	Private land 0	
	1	Bread making 25	Gathering 25	Adult females 25	Common land 1	
		Heating 25	Purchase 0	Children 7	Forest 25	
					Protected district 0	

Role of Agriculture for Fishermen's Households

(1) Ownership and Benefit of Cultivated Land

The average cultivated area per household is 0.81 ha, which is about the same as area cultivated by households in Souira Kedima. Since no land is left fallow or used for pasture, it is all cultivated. The furthest fields are only about 1 km from houses, which indicates that fields here are the most readily accessible among all the villages surveyed.

Table 5-3-C-7 Cultivated Land Use

		Cultivated Land (ha)	Fallow Land (ha)	Pasture (ha)	Devastated Land (ha)	Total (ha)	Furthest Away Field (Owner Only) (km)
Tafedna	Overall average	0.81	0.00	0.00	0.00	0.81	
	Owner average	2.33	0.00	0.00	0.00		1.04

(2) Field Cultivation and Livestock Rearing

① Cereals, Vegetables and Fruit

In addition to the staple cereals of barley, wheat and corn, which are cultivated by many households, a variety of other crops are cultivated. In Looking at the number of cultivated farm products and purchased farm products, of 19 varieties which were made the subject of investigation, the number of cultivated varieties was six, which is less than the number cultivated in the other target villages, and the number of purchased farm product varieties was 17, which is roughly the same as in the other villages. Compared to the other target fishing villages, more households purchase the staple cereals of barley and corn. According to the inhabitants interviewed, the poor cultivation conditions make it difficult to produce high quality cereals, so cultivated cereals are mixed with purchased cereals to make bread, and so on.

Table 5-3-C-8 Cultivated Farm Products and Purchased Farm Products

Tafedna		Cereals				Beans			Vegetables				
		Barley	Wheat	Corn	Other Cereals	Chick Beans	Lentils	Other Beans	Green Vegetables	Tomatoes	Potatoes	Other Vegetables	
	Cultivating households	3	9	3	0	0	0	0	0	1	1	1	
	Purchasing household	4	1	5	6	8	8	8	6	6	6	6	
		Fruit											
		Olives	Almonds	Apples	Oranges	Argand	Figs	Pomegranates	Other Fruit				Total Farm Products
	Cultivating households	0	0	0	0	0	0	0	0				6
	Purchasing household	6	6	6	6	6	0	0	6				17

② Livestock Raising

Some households raise flocks of sheep, which are put out to pasture on the alluvial fan near the river mouth. Moreover, in interviews conducted with women, it was found that they consider the production and selling of chickens to be a promising sideline.

Fishermen's Livelihoods

(1) Income from Fisheries and Agriculture in Fisherman Households

Comparing income from fisheries with income from agriculture in each fishing household, the share occupied by income from agriculture is slightly larger than seen in the other target fishing villages. Income from other activities, mainly the sale of livestock, accounts for a negligible share.

Table 5-3-C-9 Breakdown of Household Income

	April through October			November through March		
	Income from Agriculture	Income from Fishery	Income from Sale and Others	Income from Agriculture	Income from Fishery	Income from Sale and Others
Tafedna	3.42%	96.05%	0.53%	8.95%	87.37%	1.58%

Concerning the difference between winter and summer in the share of household income occupied by income from fisheries, of all the target fishing villages this was most pronounced in Tafedna where the ratio falls by approximately 9% in winter. Moreover, since income obtained from agriculture also falls in

the winter, it is thought that the winter-summer difference in the fisheries income is even greater than this.

(2) Crew per Fishing Boat and Distribution of Profits

Table 5-3-C-10 Distribution of Profits

Tafedna	Number of Persons Involved per Boat					Distribution of Catches						
	Boat Owner	Fishing Master	Crew Member	Personne l for Boat Transfer	Cleaning Personne l	Boat Expenses	Boat Owner	Fishing Master	Crew Member	Personne l for Boat Transfer	Cleaning Personne l	Others
Bottom long line fishery	0	1	3	0	1	25%	0%	38%	33%	0%	5%	0%
Angling fishery	1	1	2	0	0	15%	34%	17%	34%	0%	0%	0%
Net fishery	0	1	3	0	1	25%	0%	38%	33%	0%	5%	0%

(Bottom Long Line Fishing)

The operating crew of a single long line fishing boat consists of one chief fisherman, three crew and one apprentice fisherman, and this crew composition is the same in all the target fishing villages on the Atlantic Ocean side. In all the fishing boats that were surveyed, the boat owner also acted as the chief fisherman, but other cases do exist in reality.

As for the distribution of profits, after 25% is deducted for boat expenses, the boat owner/chief fisherman takes 38%, the crew members share 33% and the apprentice fisherman receives 5%. This method of profit distribution is the same in all the target fishing villages on the Atlantic Ocean side. Since there are three crew members, each receives approximately 11% of the profits. Comparing this with the 5% received by the apprentice fisherman, it can be said that the apprentice receives a relatively high share of the profits. The same situation can also be seen in the case of net fishing and is considered to provide a strong incentive for young people to enter the fisheries sector.

(Hand Line Fishing)

The operating crew of a single hand line fishing boat consists of one chief fisherman and two crew, and there is no apprentice fisherman. In cases where the chief fisherman is employed by the boat owner, the chief fisherman receives 17% of the profits and the two crew members share 34%, meaning that there is no difference in the share received by each. Meanwhile, the boat owner takes 34% of the profits, equivalent to the share of two crew members.

(Net Fishing)

Crew composition and profit distribution are more or less the same as in the case of bottom long line fishing. Nobody is employed to clean fishing boats like in Souira Kedima and the only people to be seen working on the beach are the fishermen and people working in the canteen and general store.

(3) Sources of Fish for Private Consumption by Fishermen and Frequency of Fish Eating

In summer the fishermen are able to obtain all the fish they need for private consumption from their own catches, but in winter only the boat owners are able to satisfy their fish requirement from catches and the crew members have to purchase 19% of the fish they need.

Table 5-3-C-11 Sources of Fish for Private Consumption

		April through October			November through March		
		Fishes from Own Catch	Purchased Fresh Fishes	Canned Fishes	Fishes from Own Catch	Purchased Fresh Fishes	Canned Fishes
Tafedna	Boat owner	100%	0%	0%	100%	0%	0%
	Crew members	100%	0%	0%	81%	19%	0%

Table 5-3-C-12 Frequency of Fish Eating

		April through October					November through March				
		Every Day	4 - 6 Days	2 - 3 Days	1 Day	None	Every Day	4 - 6 Days	2 - 3 Days	1 Day	None
Tafedna	Boat owner	0%	100%	0%	0%	0%	0%	10%	60%	30%	0%
	Crew members	0%	81%	19%	0%	0%	0%	0%	69%	31%	0%

The number of times fish is eaten per week drops by half in winter compared to summer. In summer 100% of boat owners eat fish on four to six days per week, but in winter 60% eat fish on two or three days and 30% on only one day. When one also considers that the ratio of fish buying is not very high in winter, this indicates that smaller catches lead to lower income and households respond by changing over to a diet that relies more on self-supplied foodstuffs.

Migration and Settlement of Fishermen

(1) Work at the Start of a Career in Fisheries

A feature of Tafedna is that more than 90% of fishermen are allowed to sail on fishing boats from the very start of their fisheries careers.

Table 5-3-C-13 Work at the Start of a Career in Fisheries

	Starting Age	Starting Job	
		Crew Member	Assisting Job
Tafedna	17.5	92%	8%

(2) Migration and Settlement of Fishermen

40% of boat owners have experience of working on other beaches, but this figure drops to 6% in the case of crew members. Of the said boat owners, 75% previously worked on coastal fishing boats, but of the 16 sampled crew members who have experienced work in other areas, only one (6%) experienced working on a fishing boat, and that, moreover, was an artisanal fishing boat. The current boat owners largely worked on coastal fishing boats based in the nearby large fishing ports of Essaouira and Agadir, and many of them saved the earnings they made from such work to purchase the fishing boats they own today.

Table 5-3-C-14 Migration of Fishermen

		Number of Boat Transfer Instances	Average Service Years per Boat	Ratio of Fishermen with Experiences at Other Beaches	Type of Boats Experienced at Other Beaches (Percentage)		Experienced Beach (Number of Experiences, Multiple Answers Accepted)			
					Coastal Boat	Small-scale Boat				
Tafedna	Boat owner	3.1	8.1	40% (4/10)	75%	25%	Essaouira 3	Boujdor 1	Agadir 2	Portogal 1
	Crew members	4.0	4.9 Beach average	6% (1/16) 19% (5/26)	0%	100%	Agadir 1	Boujdor 1		

(1) Natural Environment

Tafedna is situated at a mouth of Igouzoul River which passes through bluffs on the west edge of Hout Atlas. The beach is an open bay. Though we could not obtain actual figures, amount of water flow of Igouzoul River occasionally becomes remarkably big in winter because of high precipitation.

Soil type is basically red clay, but there are cobble layers within it in the whole area. Judging from the distribution of gravels and cobbles on the Igouzoul riverbed including its branches, it seems that a huge amount of stones run down when the flow rate is great.

Bottom slope of the bay is relatively gentle, and the current is from north to south near the beach. The whole area is sandy, except for reef zone formed at the root of bluffs in the north of the bay. Sand grain is remarkably small, or almost clay at the south side of the bay. According to the fishermen, water becomes muddy when waves are high although there is no inflow of silt from the river. Considering those conditions, bottom sand in the bay is supposed to be frequently scattered into water. Reef rock ecosystem formed at intertidal zone on the north side of the bay is not well developed because of sand sedimentation. As has been described before, this site is on the beach surrounded by bluffs, and there should exist more reef biotopes in the surrounding area which is developed at the same level or more than this site. Thus, the damage in the reef ecosystem due to the project in this area is unlikely to bring serious impact on the conditions of the whole ecosystem in this region. On the other hand, the fact that wash up on the beach is mostly branches and other terrestrial origins are suggesting that the Igouzoul River plays an important role to provide nutrient to ecosystems in this area.

On land near the beach, there are small-scale dunes covered with plants such as locally called "Afzdad" (probably *harocnemom* spp.). Development of the dunes is remarkable on the south side. At the places without plants, it seems that beach sand moves toward inland because of west wind. An important feature about land vegetation is that forests, mostly (algans), widely exist, especially in the north side of the area. The (algan) forests are controlled by AEFCS. Utilization of the algans are also controlled by a traditional norm called "agdal" in this district. One agdal norm says that algan seeds should not be collected until goats eat its fruit.

2. Problems in this site

Nine fishermen participated in the PCM workshop. Following is the structure of the problems appeared in the PCM workshop. (See Problem Tree)

Similar to the case in Suira Kedima, the Core Problem for the fishermen was that "their average net income (the sales of their catch after subtraction of various cost) is not sufficient". This Core Problem ultimately brings about their low living standard. Also, the lack of appropriate infrastructure and social security system was their important problem, although that was not their central concern. Safety in fishing operation and navigation was also their important problem. The direct causes of the Core Problem are the following 3 items, which are similar to the case in Suira Kedima.

- 1) Sales of their catch is insufficient.
- 2) Selling prices of their catch are low.
- 3) Cost of the whole production is high.

These direct causes can be then analyzed in light of the cause and effect relationship. The problems can be classified by field as follows (including important problems not directly related to the Core Problem). The items of the fishermen's main concern are shown with *.

[Social infrastructure]

- .* There is neither portable water nor electricity.

[Social security]

- .* There is no social security service such as pension and insurance for fishermen.

[Fishing gears, fishing methods, navigation]

- Fish finder has not been utilized.
- The sizes of vessels are too small.
- It is enormously hard work to carry vessels onto the beach.
- Supply of fish bates occasionally run short.
- .* It is difficult to access fishing places (As a result, about 2 fishermen are killed every year).
- .* Fishing gears are frequently damaged because of bad weather.
- Rescue operation for sea disaster is not systematized in terms of facilities as well as means for communication between vessels and land facilities.
- Latest weather forecast is not available.
- There is neither lighthouse nor signs for navigation.

[Services related to fishing operation]

- There is no gas station (fuel supplier) in the village.
- Prices of fishing gears and bates are high (The prices are 10% higher than that obtainable in other fishing villages such as Essaouira and Agadir)

[Infrastructure for fishery production] (Not clearly discussed)

[Distribution and economic system]

- Brokers keep distribution prices at low level. That is because;
- Traffic between main roads and beach is dangerous.
- There exists a secret price arrangement among brokers from different regions.
- There is scarce time to transport catch to larger ports or markets.
- There is no public market.
- There is no cold storage equipped with ice for the catch.

[Conditions of the village]

- The houses of fishermen are too far from the beach. (However, the distance between the beach and the houses of most fishermen is about 3km, which is relatively smaller than that in Suira Kedima and Tifnit).

3. Frame of the Development Project

As for PDM, the study members examined the results of analyses (Problems Analyses / Objectives Analyses) of PCM workshops. The goals in the development project in this site were systematized as follows (See PDM in attached). To sum up, since social infrastructure (water supply, electricity and road) have been scarcely established in this site, the development project may be centered on the promotions of fishery by improving materialistic facilities such as harbor, water supply electricity and road. It is also important to improve fishing operation in terms of fishing methods, resource management, distribution, services related to fishing and safe operation. Though public services such as medical care and education are not sufficient, these items are not included in the actions, because the residents' needs for the improvement of such services were relatively small. (Remark: This site is not far from Imessouane where another development project is under way by grant aid. It will become necessary to examine more concretely about the development project when the effects of the grant aid project will become clear.)

1) Overall Goal: "The living standard of the local residents in this commune will be improved".
(Indicator)1. Average income per fisherman will remarkably increase.

2. Household income of the local residents will remarkably increase.

2) Development Targets

- (1) Basic social infrastructure such as electricity, water supply and road will be improved. (Indicator: more use of electricity and piped water, improvement of road conditions)
- (2) Selling prices of catch will increase. (Indicator: substantial increase in the selling prices by species)
- (3) Sales volume of catch will increase. (Indicator: Increase in the sales volume by stock)
- (4) Safety in fishing operation and navigation will be improved. (Indicator: decrease in number of casualty as well as damage of fishing gears)

3) Outputs

- (1) Electric facilities will be improved. (Indicator: not clearly discussed)
- (2) Water services will be improved. (Indicator: the length of water pipe)
- (3) Roads will be repaired. (Indicator: number of the points to be repaired)
- (4) Public market will be more appropriately functioning. (Indicator: building of a hall and introduction of auction)

- (5) Annual catch volume will increase. (Indicator: Increase in catch volume by species)
- (6) Quality of marine products for sale will be improved. (Indicator: Improvement of preservation and treatment methods for marine products)
- (7) Resource management will be introduced. (Indicator: review of existing regulations on resource management, appropriate practice of revised regulations)
- (8) Wireless communications between vessels and beach will be established. (Indicator: building of a radio station and equipment of radio set with each vessel)
- (9) Local weather forecast will become available. (Indicator: utilization of the information)

4) Activities

(1) Establishment of basic social infrastructure

- ① Establishment of electricity related facilities
- ② Improvement of water supply
- ③ Improvement of road conditions
- ④ Management of the above facilities

(2) Establishment of infrastructure related to fishery production and fishery distribution

- ① Building of breakwater
- ② Building of facilities for navigation such as lighthouse
- ③ Improvement of facilities in public market
- ④ Equipment of cold storage and fuel storage
- ⑤ Management of the above facilities

(3) Improvement of fishery resource management

- ① Thorough investigation about the present stock size
- ② Review of the existing regulations on resource management
- ③ Practice of revised regulations

(4) Improvement of fishing methods and realization of safety in fishing operation

- ① Purchasing and utilization of middle-size vessels
- ② Purchasing and utilization of fish finders
- ③ Building and management of lighthouse and signs for navigation
- ④ Building of radio station and its management
- ⑤ Equipment of a radio set with each vessel

(5) Establishment of the base for fisheries cooperative organization

- ① Selection of leaders from fishermen
- ② Training of leaders (e.g. basic management skill for the improvement of fishing household economy)
- ③ Conducting of basic seminars about fisheries cooperative organization

4. Action Plans by Subject

1) Basic Social Infrastructure Development Plan

Despite the fact that public agencies such as the commune office and clinic, etc. have been located to act as the center point of the commune, the development of roads, electricity and water supply, etc. has not been advanced on a satisfactory level.

The access road of approximately 17 km that links the beach to the main road was damaged by heavy rain a few years ago, but has not since received any radical improvements. Improvement of the access road is essential for both operation of the project and development of the surrounding area, and it is necessary for MTP to immediately address this problem. Moreover, the minor roads that branch off from the access road to surrounding communities are not in a fit enough state to allow easy vehicular passage and much time is lost in the shipping of agricultural products and transportation of daily necessities, etc. Paving is not necessary, but small-scale improvement works such as widening and gradient leveling would be extremely beneficial for local inhabitants.

Concerning electricity supply, because Tafedna was not included in plans for the PERG, it is necessary to make appeals to related agencies to ensure that electrification is immediately carried out under the said program. If electricity supply can be secured, not only will this provide power for fisheries-related facilities, but communities scattered around the roads will also receive power, thus benefiting inhabitants in their daily lives and production activities.

With regard to water, there is no problem in the area around the landing beach, but electrification would make it possible to improve well pumping efficiency and to use river water for agricultural purposes in the scattered communities, and this would help to raise the income of local inhabitants and prevent surface soil wash off through aiding vegetation growth.

Social service facilities such as a school and clinic, etc. are already in place and there is considered to be no problem regarding this issue. However, any hopes of receiving a higher level of services are made unfeasible by the absence of adequate means of transport. In this respect, too, steps should be taken to improve efficiency through providing regular transportation services by multi-purpose vehicles, and so on.

2) Fisheries Infrastructure Development Plan

(1) Development Contents

The seabed gradient to the front of the sandy landing beach is extremely gentle. In these conditions, since the taking of steps to overcome the problem of drift sand would be very expensive, thus making the profitability of full-scale fishing port construction low, and sea waters around the beach and nearby fishing grounds are relatively calm, it is wise to abandon the idea of constructing full-scale fishing port facilities. Consequently, the objective for the present will be to contribute to the development of artisanal fisheries by constructing land facilities for the benefit of fishermen. Regarding fishing port-related facilities, since a slipway, etc. is considered unnecessary due to the calm nature of waters here, only leading lights on land will be provided to ensure safe navigation.

The project site will be located in front of the existing fishermen's lockers close to the rock line on the north side, and the small valley running along the rock line will be secured as a river area to deal with inundation that may occur in the event of torrential rain. Because the site is located on the sand beach, earth banking will be carried out to prevent inundation at times of high tide and the bank slopes will be protected by covering stones to prevent wave erosion.

Fisheries marketing facilities will consist of a fish market, ice storage, fisheries store room, fisheries center, workshop and fisheries-related welfare building, etc. and will be positioned according to purpose of use to make management easier. All these facilities will be placed on the banked section in consideration of traffic lines.

Concerning electricity, because Tafedna is not covered by the power grid and there is no prospect of electrification being realized in the near future, a private generator powered by diesel engine will be operated to supply power for the ice making machine and ice storage, etc. Water can be supplied from the existing well water supply system that is managed by the commune.

In terms of traffic lines, artisanal fishermen will land their fishing boats on the sand beach around the earth banking and carry their catches to the market. By stocking and selling fuel and bait, etc. in the project facilities, it will be possible for fishing boats to leave for fishing trips directly from the beach.

The access road to the site descends very steeply from the high ground and is dangerous for large vehicles that use it. Moreover, since part of the road on the 13 km section that links with the main road has been washed away by rain, improvements need to be carried out to ensure that tank lorries and large refrigeration trucks can pass safely.

(2) Project Cost

The cost required for the above-mentioned fisheries infrastructure development project is estimated at 18,999,000 DH.

(3) Operation and Management Plan

Of the fisheries-related infrastructure, the fish market will be operated by the Fisheries Public Corporation (ONP: Office National des Peches). As a rule, the ONP will assign two market operating staff (one manager and one employee) to mediate the sale of fish by auction between fishermen and agents, although more staff may be assigned depending on the size of catches. The staff will collect 5% of the auction price as commission for their services, and this will be the sole source of income for the ONP at the market. From the said income, the ONP will pay personnel expenses, heating and lighting expenses and market facilities maintenance costs. Moreover, 2% of the said 5% commission charge will be returned to the fishermen in the form of a social security contribution (for pensions, life insurance and hospital cost subsidization, etc.).

The other land facilities (fishermen's lockers, workshop, ice making and ice storage facilities, toilets and hamam, refueling facilities, etc.) will be operated and managed by a new body to be newly organized around the local fishermen's cooperative association. The main work areas of the new body are as follows.

- ① Landing and handling (landing of fish from boats and carrying to the fish market)
- ② Ice retailing (sale of ice for marketing purposes)
- ③ Ice storage rental (leasing of ice storage space for temporary storage of long line bait and unsold fish)
- ④ Fuel retailing (procurement and sale of tax-free gasoline)
- ⑤ Facilities rental (leasing of fishermen's lockers and the workshop, etc.)
- ⑥ Fisherman services (operation of hamam or local style showers)

The operating organization will be divided into a steering committee, to act as the decision making organ, and an executive organ. The steering committee will be composed of the manager of the DRAM in Essaouira and fisherman and commune representatives, whereas the executive organ will be made up of full-time staff employed by the steering committee. As a rule, staff will be recruited from the local area, however, if no suitable human resources exist, especially to fill the specialist roles of management, accounting and ice making and ice storage engineering, recruiting will be carried out in the nearest city. It is intended for the operating body to function on a self accounting system based on income derived from the above-mentioned services.

3) Improvement of Fisheries Resource Management

Artisanal fisheries resources in the waters around Tafedna are estimated to be in a sound state. As a result of fisheries production infrastructure development and improvement in catching efficiency, it is forecast that the catching effort will increase by around 8% and catch sizes by a similar amount, however, the presently available data are not sufficient to estimate the volume of local resources and accurately forecast the size of catches. For resource management to be effective, the understanding and cooperation of fishermen are essential, but it is also necessary to collect scientific information that can convince the fishermen of the need for resource management. Taking the opportunity provided by infrastructure development, it is important that the resource monitoring and management setup be bolstered.

(1) Monitoring of Resources

A setup which reports on the quantity of all landed fish and shellfish by fishing method and fish type for each fishing boat will be established. Moreover, the ONP will record for each fishing boat the weight and sale price of fish that are put up for auction in the fish market. Upon determination of the facility construction plan, personnel would be dispatched from ONP to begin preparations for the aforementioned setup and commence sample data collection.

Concerning spiny lobsters and European lobster, which are the most important fish caught in the area, through carrying out year-round sampling, surveys of sex-separate fish length and weight and egg bearing conditions will be implemented and understanding gained on the current conditions and distribution of resources. Since there is a danger that fishing of these species by trammel nets will place too much pressure on resources, it is necessary to carefully monitor for fishing activities that disregard regulations on allowable fish size and break the fishing prohibition season.

Similar surveys will be implemented with respect to gurnard, European sea bass and conger. Concerning squid, it is desirable to conduct surveys in cooperation with other sites.

Surveying will be carried out by the survey ship and INRH team stationed in Souira Kedima. The site will need a computer and weighing and measuring apparatus.

(2) Resource Management System

The number of artisanal fishing boats using Tafedna and surrounding landing sites will be strictly monitored. When fishing boats are registered or move to new sites depending on the season, their obligation to report to the DRAM will be strictly enforced. For this reason, a system needs to be established whereby fishermen receive some benefit through registering, and this issue will be examined by the fishermen's cooperative association. Generally speaking, the new construction of artisanal fishing boats will not be allowed and size limit will be placed on the construction of boats for replacement.

Numerous opportunities will be taken to explain the importance of existing fisheries regulations to fishermen, and regulations will be enforced more strictly at landing and selling sites. These activities by the DRAM would be commenced upon determination of the facility construction plan.

3) Fisheries Technical Improvement Plan

Thought concerning technical improvement will be given from the viewpoint of trying to preserve fisheries resources in a healthy state and stabilize the livelihoods of fishermen.

Existing fishing gear and fishing methods are not perfect, however, since operating days will be increased and operating efficiency will be improved through the introduction of fish finders and GPS, further improvements are not considered to be necessary.

Varying fishing methods is one way to stabilize artisanal fisheries and since it is thought that many migratory fish such as horse mackerel, atlantic mackerel and sardine come to waters around Tafedna, efficient hand line fishing that utilizes many hooks (in the same way as sabiki fishing) will be introduced.

It is also worth giving a try to the trawling of tuna which seasonally migrate to the local waters. There may be competition with coastal fishing boats, however, fishing grounds can be secured through placing fish aggregating devices (FAD) in outer sea waters (of depth 500 m or more).

The safety of fishing operations will be greatly enhanced through construction of the lighthouse and placement of navigational aids, etc. Concerning a rescue setup to deal with shipwrecks and accidents, it is first necessary to build a system that prevents accidents from occurring at all. First, it is desirable to develop a method for promptly transmitting weather information to fishing boats. Various measures can be considered such as designating Tafedna as a model area for commencing the diffusion of maritime radio to enable the transmission of weather information from meteorological observatories and nearby towns. Also, the stationing of a rescue boat in Essaouira is another item for consideration.

The local fishermen appear interested in adopting larger fishing boats to improve navigational safety, however, it is desirable to avoid dramatic change but steadily replace deteriorated fishing boats with boats that are 1-2 m longer.

4) Plan for Developing a Base of Fishermen's Cooperative Association Activities

An organization that calls itself a fishermen's cooperative association already exists in Tafedna, however, as was explained previously in the Master Plan, it is not clear how far this acts as a bona fide cooperative association. Compared to fishermen in Souira Kedima, the fishermen of Tafedna seem to possess a greater sense of unity, however, they do not appear to be sufficiently trained. The things required most in Tafedna at the moment are an understanding of the true meaning of a fishermen's cooperative association and the appearance of grass roots leaders; it is not desirable to see a few people make private profits under the guise of a supposed cooperative association. Concerning agricultural cooperative associations in Morocco, technical guidance and support with respect to production are provided by the Ministry of Agriculture, while the Cooperative Association Promotion Agency (ODECO: Office de Developpement de la Cooperation) is responsible for the provision of management technology and legislation. If basic social training relating to literacy education, fishing log campaigns, savings campaigns, environmental beautification campaigns and leader training, etc. can be carried out under the coordinated efforts of MPM, the commune rurale, ODECO and CNCA, etc., this would aid understanding of the real meaning of a cooperative association and encourage the appearance of grass roots leaders. However, in consideration of the fact that a commune rurale that possesses a certain degree of administrative capacity already exists in the fishing village and the market is too small for business management to be performed by the ONP, the operation of marketing facilities will for the time being be entrusted to the commune rurale under the supervision of MPM. After that, it is appropriate to gradually transfer authority to the fishermen's cooperative association from the point where it is considered that sufficient administrative capacity has been nurtured among the fishermen as a result of the social training.

5. Project Evaluation

1) Financial Analysis

(1) Project Cost

Concerning the initial investment cost that will be put into project implementation, the facilities construction cost is calculated based on general construction rates (tax-separate) in Morocco, and the equipment supply cost is based on local prices with respect to locally procured items and prices in Japan with respect to imported items. In addition, a consultant supervision cost equivalent to 8% of the total equipment supply cost is also taken into account. Land acquisition cost is not counted because the project site is located on state-owned land. Operating costs following the completion of facilities are calculated

based on prices in Morocco. The breakdown of these costs is indicated in Table 16.

(2) Project Benefit

The effects that can be anticipated as a result of project implementation are as follows.

- ① Increased operating time
... Effect gained through ice storage installation. In other words, fishermen can decide when to return to port without being limited by the activities of agents.
- ② Increased fish prices
... Effect gained through realization of total competition between agents via the fish market
- ③ Improved quality of handled fish
... Effect gained through use of ice
- ④ Reduction of fisheries-related expenses
... Construction of the slipway will make fishing boat maintenance easier and extend the service lives of boats. Moreover, through provision of the workshop, fishing gear store and long line bait store, time that was previously spent on procuring outboard engine parts, fishing gear and bait will be saved.

Specific effects in the event of project implementation are as follows.

- A. It is forecast that the annual landed quantity of fish will increase by approximately 5% from the present 1,402,240 kg to 1,472,240 kg.
- B. It is forecast that average fish prices will increase by approximately 5% from the present 16 DH/kg to 16.8 DH/kg.

The profits which these project effects will bestow on the operating body are as follows. The breakdown of these benefits is indicated in Table 17.

- ① Landing commission
6% of successful bid prices at the market will be levied, 1% of which will go to the fishermen's cooperative association and 5% to the ONP.
- ② Ice sales
- ③ Fuel sale commission
For every liter of fuel sold, 0.2 DH will be levied as a commission charge.
- ④ Facilities leasing charge
Charges from the lease of fishermen's lockers, the workshop and stores, etc.
- ⑤ Other income
Canteen sales and hamam charges
- ⑥ Fishermen's cooperative association contribution
In the first year only when the fishermen's cooperative association is established, a contribution will be levied from fishermen who join the association.

Incidentally, concerning the residual value of the capital expenditure, this is not taken into account because the target facilities are largely intended to serve the public benefit.

(3) Project Profitability

The FIRR works out to be 6.01%, as indicated in the calculation table shown in Table 18.

The long-term interest rate offered by financial institutions in Morocco is the official lending rate of 9.25% (+ Alpha), but in reality is closer to 12% after various commissions and charges are taken into account.

Since the FIRR is less than the lending rate, it is forecast that the project is unable to generate enough benefit to repay the capital expenditure, and is thus concluded that it cannot be a profitable concern. Since even the long-term lending rate offered by the World Bank and other international financial institutions is set at around 8%, profitability could still not be secured even if the source of funds was changed. In conclusion, it is thought wise to consider implementation of the project through grant aid, etc. Sensitivity analysis was carried out upon adjusting the expected increase in the quantity and average price of landed fish in the manner shown below.

Table 5-3-C-20 FIRR Sensitivity Analysis

Increases in Landed Quantity	Increases in Average Fish Price	FIRR
2%	3%	5.52
	5%	5.70
	7%	5.88
5%	3%	5.80
	5%	6.01
	7%	6.21
8%	3%	6.12
	5%	6.32
	7%	6.51

As a result, even by varying the expected levels of increase in the quantity and average price of landed fish, the likelihood of achieving a profitable project is still low.

2) Economic Analysis

(1) Project Cost

Using the same cost items as those adopted in the financial analysis, only the prices are corrected, from market prices to shadow prices. In other words, concerning the capital expenditure, the facilities construction cost is multiplied by the shadow construction coefficient, and the equipment supply cost is multiplied by the shadow exchange rate with respect to imported items and by 1.0 with respect to locally procured items. Concerning operating costs, personnel expenses are multiplied by the shadow labor coefficient with respect to unskilled labor, and transfer items such as TVA, etc. are deducted from other expenses such as lighting and heating costs, etc. Concerning the value of land that is lost as a result of facilities construction, this is not be taken into account because it is currently sandy beach not used for any particular production activities. The breakdown of these costs is indicated in Table 19.

(2) Project Benefit

The following three benefits can be anticipated as a result of project implementation.

- ① Increased quantity of landed fish (the extra amount will contribute to increasing the amount of fish exported and the amount supplied to the domestic market)
- ② Increased fish prices
- ③ Ice production volume

The value of the increased amount of fish for export is first converted to the FOB price in force at the main trade port of Agadir (domestic marketing coefficient: 1.15) and then multiplied by the shadow exchange rate (1.14). In the economic analysis, since the consumer surplus resulting from project implementation is

also treated as a benefit, the value of the increased amount of fish for supply to the domestic market is calculated by converting the price in the production area to the price in the main consumer area of Agadir market. Concerning increase in the volume and price of landed fish, the same anticipated values as used in the financial analysis are adopted. The breakdown of these benefits is indicated in Table 20.

The construction of refueling facilities, a fishing gear store and outboard engine workshop under the project will result in a cost saving benefit in that time previously spent traveling to the nearest such facilities can be saved on, however, by assuming that this benefit will translate into greater operating time and thus increased catches, it is not treated as a separate item.

Income from commission and lease charges, which is taken into account in the financial analysis, is not considered in the economic analysis since it is viewed as domestic transfer of services.

(3) Level of Priority of the Project

The EIRR is 14.40%, as indicated in the calculation table shown in Table 21.

Sensitivity analysis was carried out upon correcting the quantity and average price of landed fish following project implementation in the following way.

Table 5-3-C-24 EIRR Sensitivity Analysis

Increases in Landed Quantity	Increases in Average Fish Price	FIRR
2%	3%	5.10
	5%	9.02
	7%	12.56
5%	3%	10.86
	5%	14.40
	7%	17.78
8%	3%	15.99
	5%	19.45
	7%	22.84

Since it has been decided that full-scale fishing port facilities are not required in the project and construction is limited only to land facilities, the capital expenditure is greatly reduced, and this translates into a high EIRR value in the calculation. Indirect items that cannot be measured in money terms are vitalization of physical distribution as a result of road improvement, greater convenience in daily life and increased productivity as a result of generator installation, and so on. Moreover, as a result of being able to enter the social security system through selling catches via the ONP, fishermen will have a greater sense of security in their daily lives.

3) Environment Impact Assessment

(1) Natural Environment

In this site, major part of sand has been provided by Igouzoul River and also by dunes near the beach. Sand in water tends to move to the south in the bay. Since the bay is relatively shallow, the port designed in the north of the bay should be constructed 350m off shore so that the influence of drift sand can be avoided. If the fishery port is constructed in small scale, it seems inevitable to be affected by sand. Thus, this project plan does not include construction of offshore facilities.

The plan shows space for the land facilities are to be prepared by reclaiming the beach in front of the existing fishermen's lockers. Selecting beach area for the construction should be appropriate, considered

that hill top of the north side is mostly covered by algal dominant forest, most of the other hill areas are vulnerable to erosion. However, most of the fishermen's locker is also used for tourists accommodation, and loss of the beach in front of them may cause degradation of touristic value of the lodgings. At least, acceptance of the construction of fishery facilities should be gained from the owner of the lodges.

It is possible to divide the beach in terms of usage, by putting fishery on the north side of the river and tourism on the south side. However, it is necessary to consider the effects of offensive odor from the fishery facilities located on the north edge of the bay, because wind blows mostly from the north. Increase of effluent from the fishing facilities is not supposed to be big, and the effluent will be treated by filtration, thus, impact of the effluent is unlikely to be considerable. However, cautions for eutrophication should be made because of the following reason. It seems that the water tends to remain stationary although the bay is widely open on the south side, judging from the following factors. First, the water flows mostly from the north to the south. Secondly, sand grain is fine at the south side of the bay.

In our observation, bottom material on the south side of the bay is muddy, suggesting that the soil tends to catch nutrient salt. For that reason, eutrophication may occur at the bottom centering around the south side of the bay, if sewage from fishery facilities and tourist accommodations will not be disposed appropriately. Special attention should be paid to the conditions in summer when rainfall decreases and water temperature is high, whereas the number of tourists increases. Further investigation is needed for more accurate estimation.

On the other hand, land is subject to erosion mostly by rivers. Large stones occasionally flow. River water containing stone gushes down along the sharp valley, destroying access roads in the area. It is then indispensable to examine this aspect at the road planning.

For other remarks, it is possible that salinization of water may occur depending on the location of wells which will be constructed for residential use. Decision of the construction period should be made in consideration to its impact on tourism.

(2) Social Environment

① Impact on Relationship Between Fishermen and Middlemen

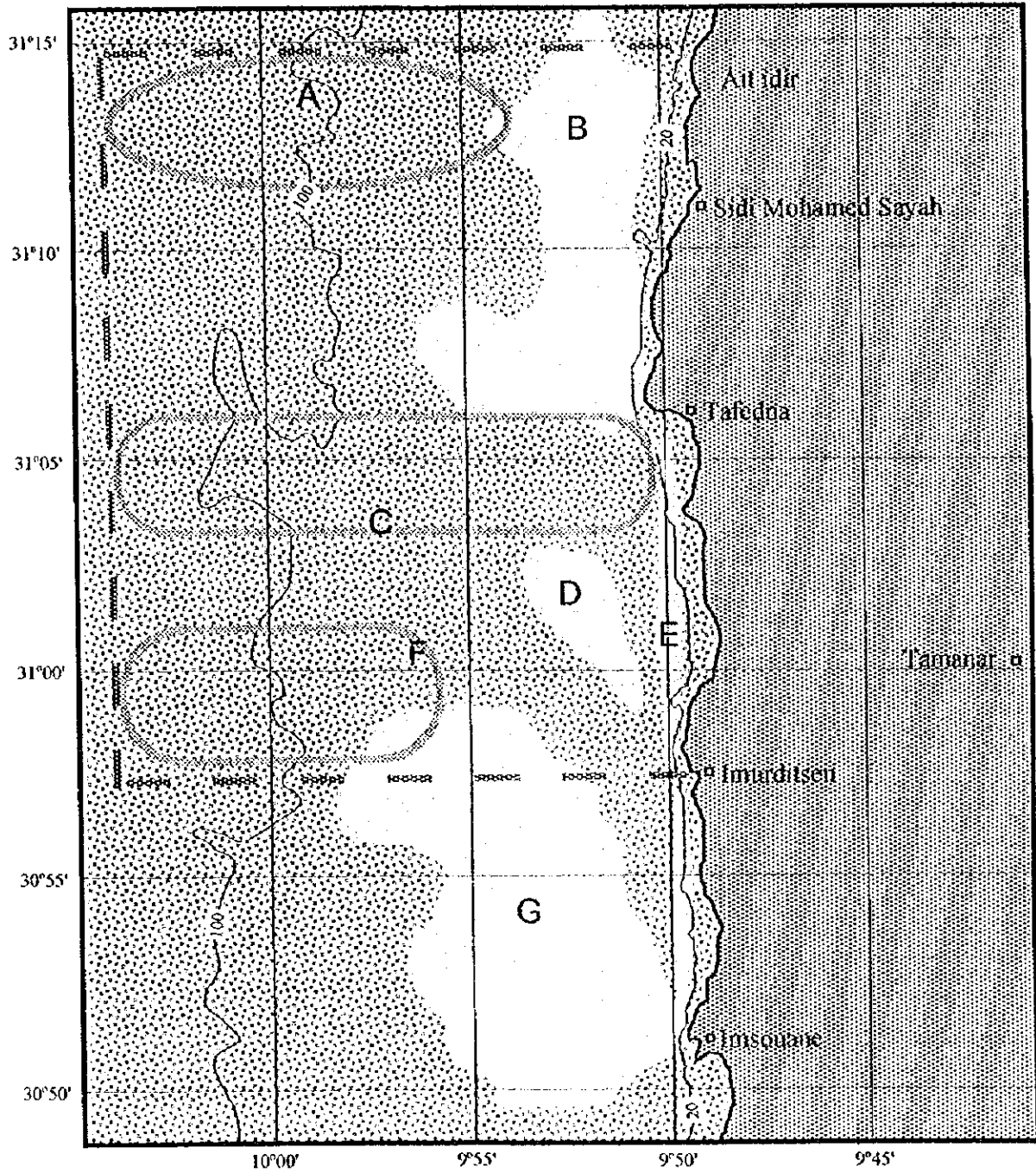
The fishermen rely relatively strongly on the middlemen, however, this reliance is concerned more with fishing gear, bait and fuel, etc. when directly relating to fisheries activities rather than to the daily life. Some fishermen rent stores from middleman, but middlemen, not necessarily from agents on whom they rely. Moreover, relations between fishermen and the middlemen are relatively fluid, with fishermen sell their catches to differing agents depending on the best price offered at the time. In view of these points, establishment of the market will not create any major problems between the fishermen and the middlemen.






② Population Movement to Areas around the Project Site

Fishermen who use the project site live in widely scattered over and there is a rush to move closer to the beach. Since the fishermen also conduct small-scale agricultural activity, it is possible that they might move only their homes and leave their farmland in a workable state. It is possible that full-time farmers living further inland also might want to combine agriculture with fisheries, but it is thought that this would not entail house moving. If such farmers do move, since they would bring their livestock (goats, sheep, etc.) with them, population concentration around the beach may adversely affect the local vegetation. As the basic strategy, house transfer will be limited by building more fishermen's lockers for short-term accommodation and improving means of transport to and from the beach.



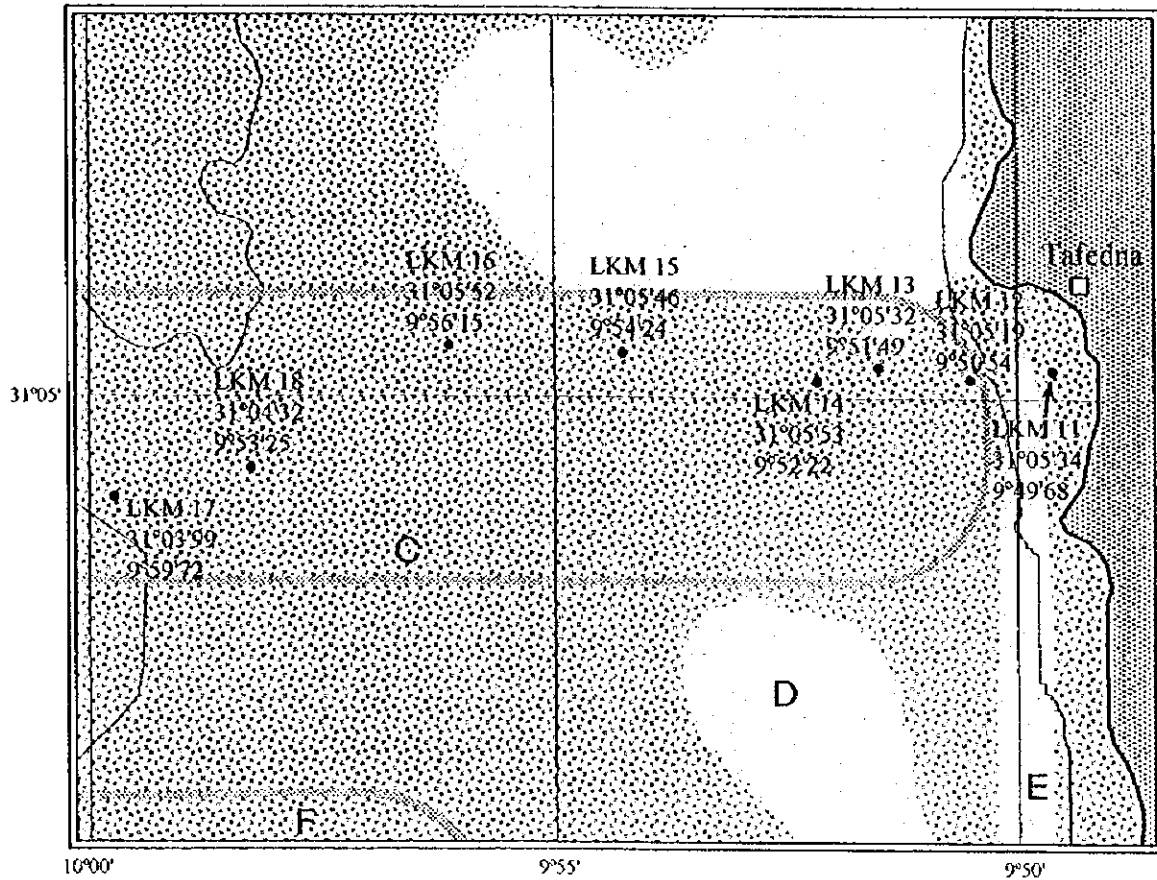
Fishing Ground of Tafedna



-  Rocky Bottom
-  Sandy Bottom, Trawling Fishing Ground
-  Land
-  Good Fishing Ground
-  Fishing area of Tafedna



Measurement Points of Fishing Ground of Tefedna





Global Positioning system (GPS) Data
Tafedna

Rock=R
Sand=S

Location	Latitude	Longitude	Location indicator or name	Bottom material	Depth m	Temp. °C	Observation
LKM11	31° 05' 34 N	009° 49' 48 W	Tafedna Beach	S			Low tide, 100 m to the water from the high tide mark.
LKM12	31° 05' 19 N	009° 50' 54 W	Very shallow rocky area near Tafedna	R	9		White waves. A sign of fish school in the fish finder.
LKM13	31° 05' 32 N	009° 51' 49 W	West of Tafedna	R	45		Lobster trap, trammel net
LKM14	31° 05' 53 N	009° 52' 22 W		R	42	17	Trammel net was located.
LKM15	31° 05' 46 N	009° 54' 24 W		R			A trawl boat was seen off shore
LKM16	31° 05' 52 N	009° 56' 15 W		R	65		A school of Dolphin was seen.
LKM17	31° 03' 59 N	009° 59' 72 W		R & S	100	20.3	Trammel net and long line fishing ground.
LKM18	31° 04' 32 N	009° 53' 25 W	Near the river mouth	R	45	18.8	Trammel net fishing ground

Fishing ground information of Tafedna

Fishing ground A is shared with Essaouira fishermen.
Tafedna fishermen usually use the fishing ground C. The water depth is up to 120 m (some times 180 m?).
Gill net, trolling, hand line, jig, and traps are usually used in near shore shallower waters including area B ,D, and E.
Fishing ground F is shared with Imssouane fishermen.
Fishing grounds B ,D, and E are often used when the weather is bad.
Fishing grounds B is used by trawlers from Essaouira and fishing grounds E and C are used by trawlers from Agadir.
Trawlers also operate in the deep and sandy area where the water depth is 200 m.

Problem Tree
 9/15-16 Workshop
 in Tafedna

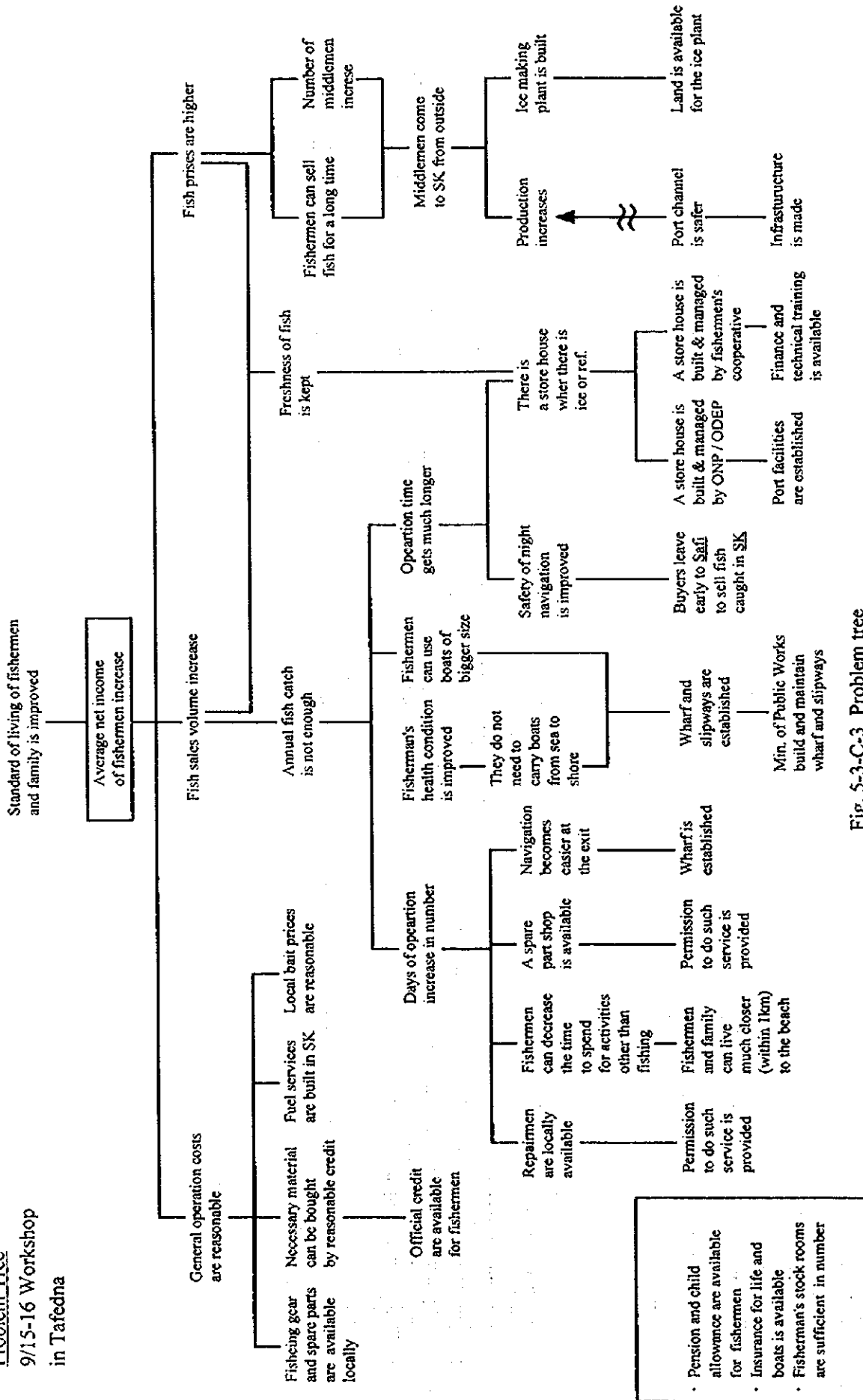
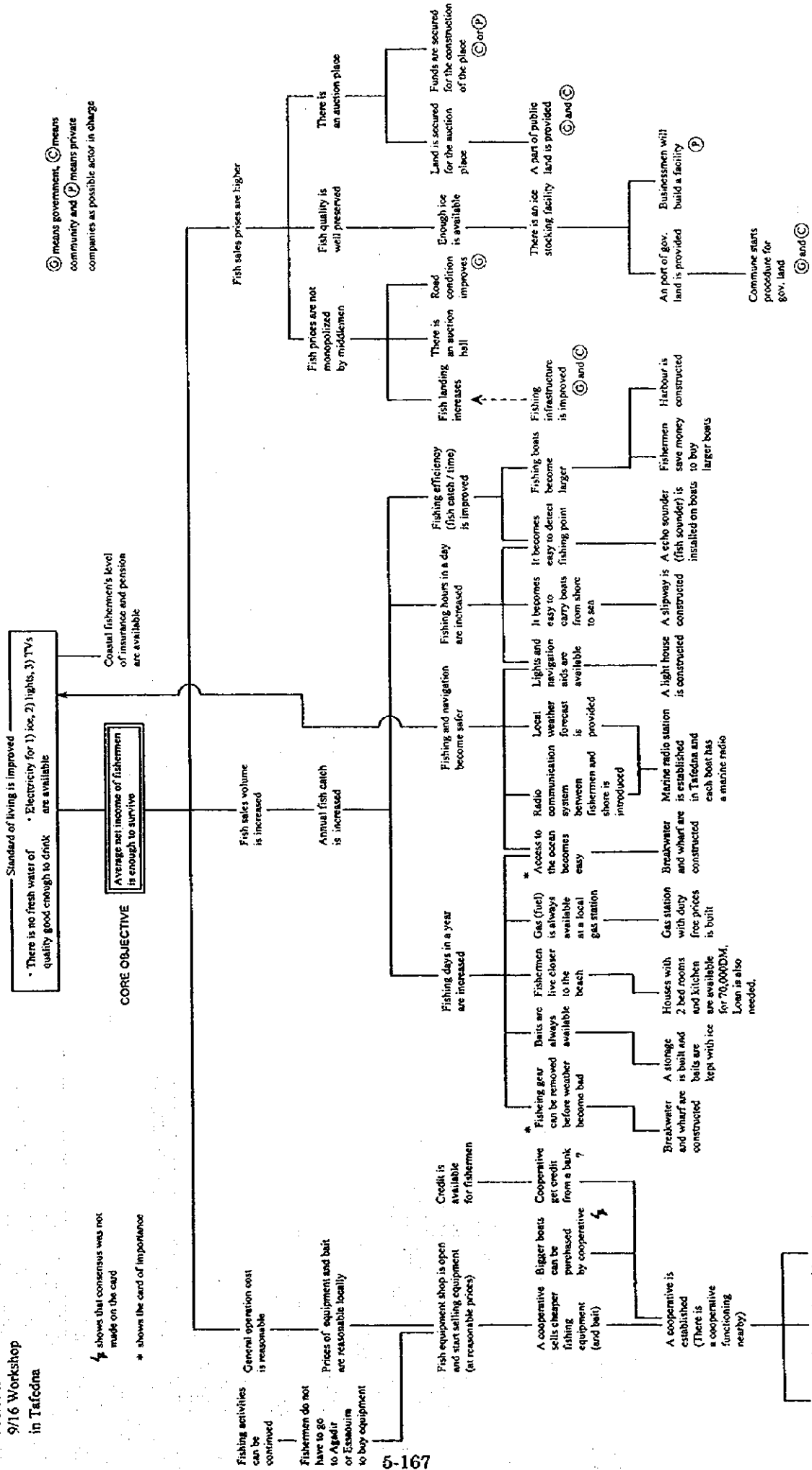


Fig. 5-3-C-3 Problem tree

Objective Tree
9/16 Workshop
in Tafedna

Ⓢ shows that consensus was not made on the card
* shows the card of importance

Ⓢ means government, Ⓢ means community and Ⓢ means private companies as possible actor in charge



Good leader is chosen
Operational cost for cooperative is funded
Management know-how is provided

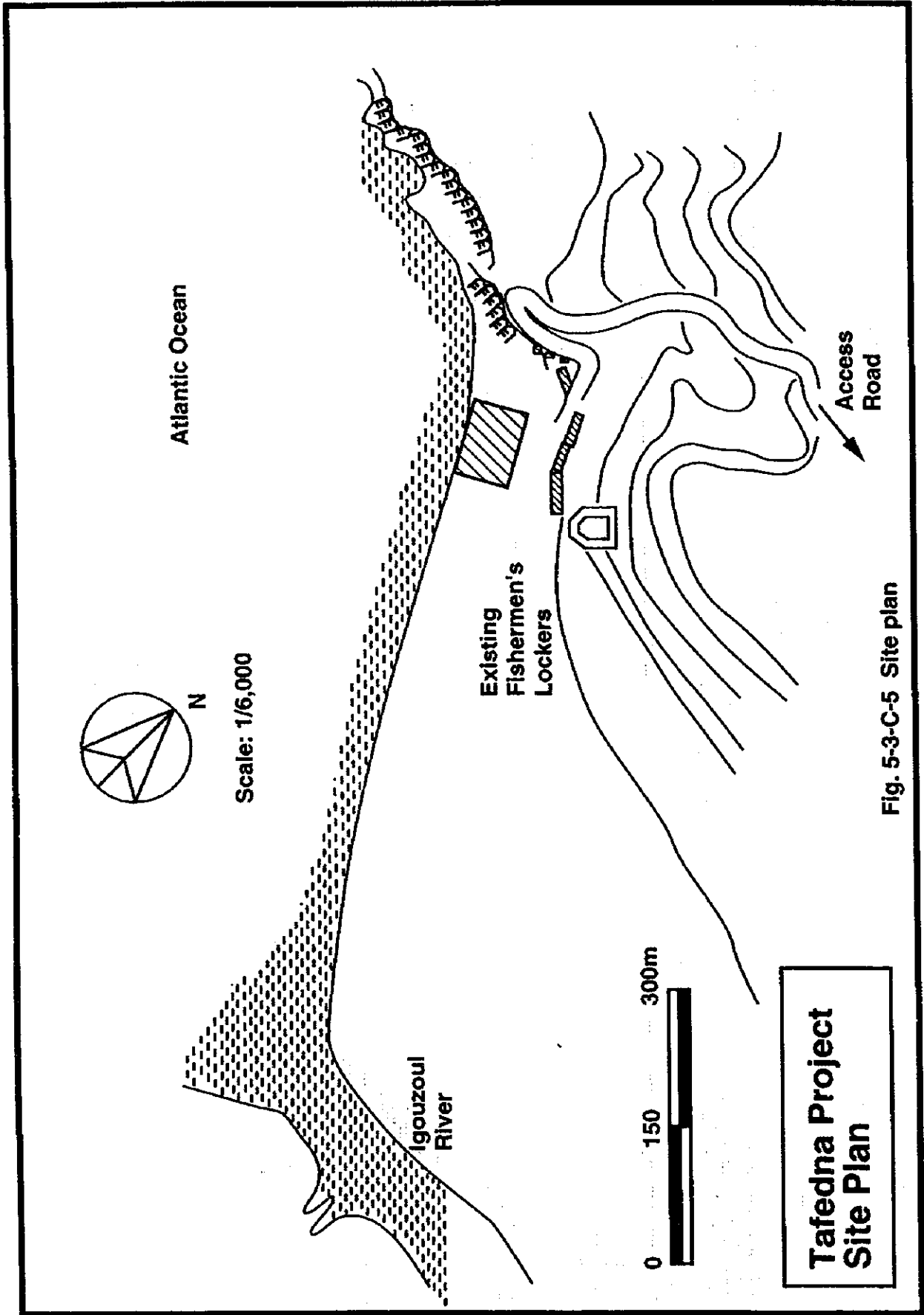
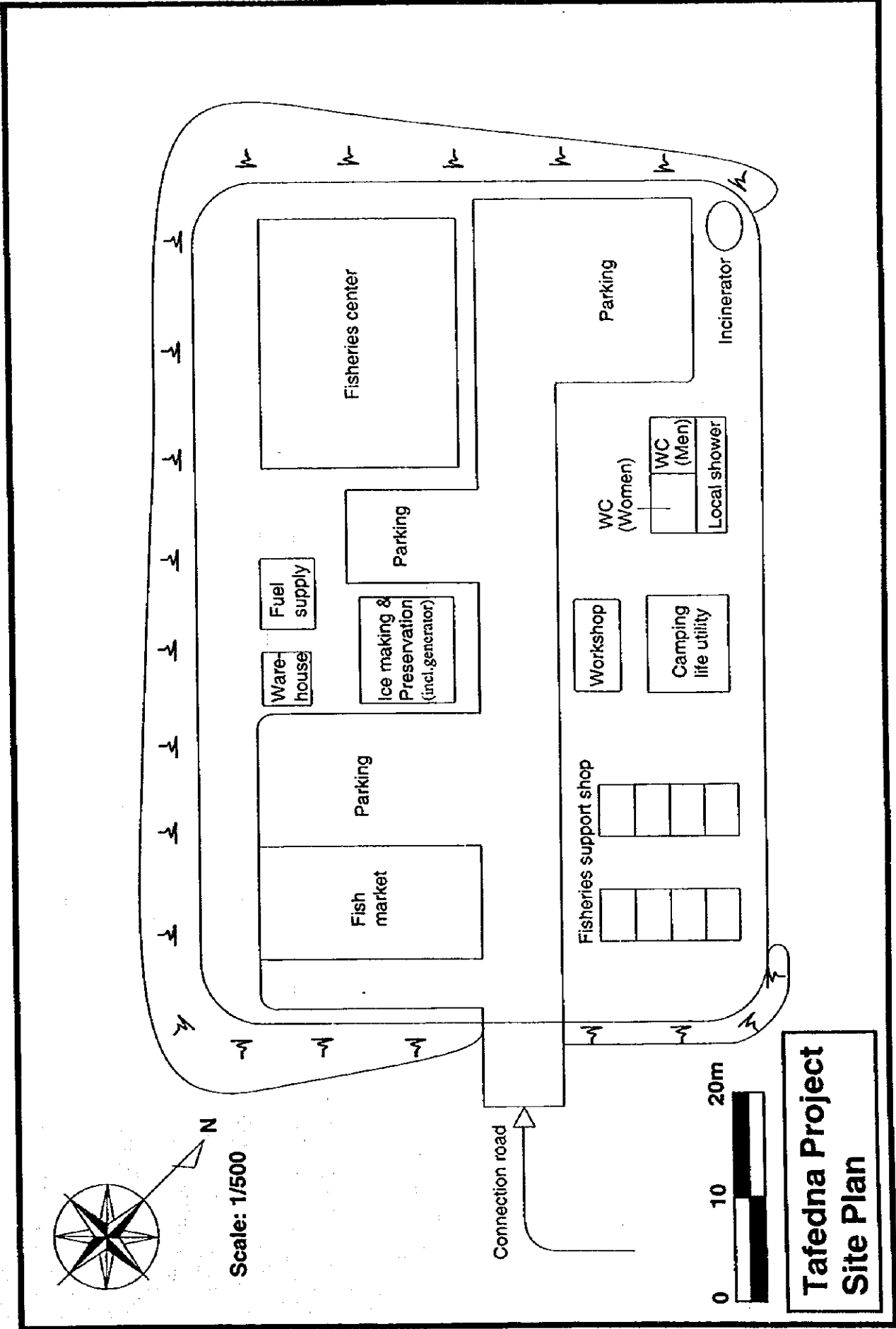


Fig. 5-3-C-5 Site plan



Project Design Matrix (PDM) on Tafedna 1/4 (First Draft)

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
<p>Overall Goal</p> <p>General standard of living of residents in commune including Tafedna is increased.</p>	<p>(With the time frame of 10 years for example)</p> <ol style="list-style-type: none"> 1. Significant increase of an average net income of fishermen per person (estimate) 2. Significant increase of average household income of residents (estimate) 	<ol style="list-style-type: none"> 1. and 2. Survey (random sampling) 	<ol style="list-style-type: none"> 1. There is no significant change in the governmental policies on artisanal fisheries. 2. Proper maintenance is undertaken for fisheries infrastructure. 3. Demand for fish does not decrease.
<p>Development Targets</p> <ol style="list-style-type: none"> 1. Basic social infrastructure (electricity, fresh water and better road) is operational. 2. Fish sales prices are improved. 3. Fish sales volume is increased. 4. Fishing and navigation become safer. 	<p>(With the time frame of 5 years for example)</p> <ol style="list-style-type: none"> 1. Availability of electricity, fresh water and better road condition 2. Net increase (inflation-adjusted) of fish sales prices broken down by fish species 3. Increase of fish sales volume broken down by fish species 4. Decrease of the number of injured people and casualties and loss of fishing material 	<ol style="list-style-type: none"> 1. Official record of use of electricity and water Survey for road condition 2. Sales record of public auction 3. Same as above 4. Official statistics or survey 	<ol style="list-style-type: none"> 1. Quality of basic public services (education and health, for example) is maintained. 2. Residents' income from sources other than fishing is maintained.

Project Design Matrix (PDM) 2/4

<p>Outputs</p> <ol style="list-style-type: none"> 1. Facility related to electricity is established. 2. Facility related to fresh water is established. 3. Roads are repaired. 4. Fish auction functions properly. 5. Annual fish catch is increased. 6. Quality of fish is improved. 7. Fish resource management is introduced. 8. Radio communication system between fishermen and shore is introduced. 9. Local weather forecast information is available for working fishermen. 	<ol style="list-style-type: none"> 1. 2. Length of water pipe 3. Number of repaired points of road 4. An auction hall is established and auction takes place actively. 5. Increase of fish catch (broken down by fish species) 6. Improved fish handling process 7. Revision of resource control regulations Satisfactory application of these regulations 8. Establishment of a radio station and installment of radios in boats 9. Use of weather forecast information 	<ol style="list-style-type: none"> 1. Administrative record 2. Administrative record 3. Administrative record 4. Sales record of public auction 5. Sales record of public auction 6. Survey 7. Document Administrative record of relevant authority 8. Survey 9. Survey 	<ol style="list-style-type: none"> 1. Demand for fish does not decrease. 2. There is local broadcasting service on weather information.
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<p>Activities (expected persons/organizations in charge are shown by symbols; G-government, C-commune/fishermen, P-private business sector)</p> <p>1. Basic social infrastructure</p> <p>1) To undertake necessary construction for electricity (G)</p> <p>2) To undertake necessary construction for drinking water (G)</p> <p>3) To undertake necessary repair for existing roads (G)</p> <p>4) To maintain the above infrastructure (G)</p> <p>2. Fisheries infrastructure</p> <p>1) To establish and maintain breakwater (G)</p> <p>2) To establish and operate lights and navigation aids (related to activity #6 as well) (G)</p> <p>3) To build proper auction facility (related to activity #5 as well) (C)</p> <p>4) To build storages of fish, bait and fuel (related to activity #5 as well) (C andP)</p>	<p>Input</p> <p>Necessary financial input should be estimated here.</p>	<p>1. Coastal fisheries do not affect artisanal fishing.</p> <p>2. There is no weather extreme which affects fishing activities.</p> <p>Pre-conditions</p> <p>1. Government and related public agencies are cooperative to the development plan.</p> <p>2. There is no influential local individuals or organizations which are against the plan.</p>
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<p>3. Fish resource management</p> <p>1) To conduct comprehensive resource surveys (G)</p> <p>2) To revise existing regulations (G)</p> <p>3) To put these regulations into practice (G and C)</p> <p>4. Fishing methods</p> <p>1) To purchase bigger boats and use them (C)</p> <p>2) To purchase echo sounders and use it (C)</p> <p>5. Fishermen's group activities</p> <p>1) To set up groups of fishermen (C)</p> <p>2) To build and manage the following facilities;</p> <ul style="list-style-type: none"> - auction place (C) - storages of fish, bait and fuel (C and P) <p>6. Fishing and navigation safety</p> <p>1) To support fishing and navigation by lights and navigation aids (G)</p>		
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Tafedna

Scope of facilities		Name of facilities	Scale of facility	Note
Port facilities	Outer facilities			
	Mooring facilities			
	Water facilities	Navigation aids	Navigation light : 1 set	
Port service facilities	Fish preservation facilities	Auction hall	Building area 200m ²	Operated by ONP Flake Fish & bait Agar-agar Engine Gasoline, Operated by private 5 booth Use of incinerator heat Cooking table, laundry Septic tank & subsurface infiltration
		Ice making & preservation	Building area 100m ²	
		Ice making plant	2ton/day, Ice storage 6ton	
		Chilled room	3ton, 30m ²	
	Boat & gear maintenance facilities	Warehouse	Building area 20m ²	
		Workshop	Building area 30m ²	
	Supply facilities	Fuel supply		
	Fishermen's welfare facilities	Fisheries support shop	20kl Fuel tank	
		Toilet & shower	Building area 50m ²	
		Camping life utility	Building area 30m ²	
Management facilities	Fisheries center	Building area 30m ²		
Treatment facilities	Drainage treatment	Building area 430m ²		
	Incinerator	Harbor area		
Fishermens village social infra-structure	Road	Connection road	Improvement of damage part	Control by TP with electrification with electrification with electrification within walking distance
		Fishermen's village	Improve	
	Water supply	Branch water distribution	Well water supply system	
	Electricity supply	Main & branch line	Required	
	Drainage & garbage treatment	Drain gutter, sewer	Required	
	Public facilities	Community center	No need	
Equipment	Fish handling equipment	Fish box, balance, cart, etc.		
	Workshop tools			
	Mulch purpose car	Mobilization		

Table 5-3-C-17 Financial Analysis - Cost (i)

Financial Analysis
Capital Expenditure (CAPEX)

Area	Facility	Scale	Unit	Unit price (DH)	Price (DH)	Remarks
Port facilities					4,458,333	
	Revetment	200	m	16,667	3,333,333	
	Navigation aids	1	set	125,000	125,000	
	Land	12,000	m3	83	1,000,000	
Port service facilities					12,466,667	
	Fish market	200	m2	5,833	1,166,667	
	Ice & preservation	100	m2	5,833	583,333	
	Fisheries center	430	m2	5,833	2,508,333	
	Workshop	30	m2	4,167	125,000	
	Warehouse	20	m2	4,167	83,333	
	Generator	1	set	83,333	83,333	
	Drainage treatment	1	set	833,333	833,333	
	Ice making plant	1	set	2,083,333	2,083,333	
	Chilled room	1	set	1,250,000	1,250,000	
	Connect'n&insite road	500	m	4,167	2,083,333	
	External work	1	set	1,666,667	1,666,667	
					666,667	
Equipment						
	Fish handling	1	set	416,667	416,667	
	Workshop	1	set	250,000	250,000	
Consulting fee		1	set	1,407,333	1,407,333	
Total					18,999,000	

Table 5-3-C-17 Financial Analysis - Cost (ii)

Operation Expenditure (OPEX)

550,327 DH/Year

Personnel Cost

Area	Title	Unit Price(DH)	No. of person	Cost (Month)
Administration	Manager	2,500	1	2,500
	Accountant	2,500	1	2,500
	Secretary	1,300	1	1,300
Ice machine	Engineer	2,700	1	2,700
	General worker	1,200	1	1,200
Workshop	Engineer	2,000	1	2,000
	Carpenter	1,400	1	1,400
Hamam	Worker	1,200	1	1,200
Fuel Station	Worker	1,200	1	1,200
Others	Security men	1,200	2	2,400
Fish market	Manager	2,500	1	2,500
	General worker	1,200	1	1,200
Total (month)				22,100
Total (year)				265,200

Cost of utility

Item	Use	Consumption	Unit price	Price (DH)	Remarks
Electricity	Ice machine	26	291	7,639	base charge (year)
		15,120	0.99	15,038	monthly use
	Refrigerator	216	1.27	274	monthly price
	Lights and others	768	1.30	998	monthly price
Total (year)				203,368	
Item	Use	Consumption	Unit price	Price (DH)	Remarks
Water	Fish market	100	5.83	583	monthly price
	Ice machine	135	5.83	787	monthly price
	Others	40	5.83	233	monthly price
Total (year)				19,239	

Maintenance and Operation Cost

facility	Cost (month)	Remarks
Workshop	500	
Hamam	1,710	fuel cost
Ice machine	500	
Building	500	
Other expenses	2,000	vehicles etc.
Total	5,210	
Cost (year)	62,520	

break down	daily consump'n	15
	unit price	3.8
	no. of days	30

Table 5-3-C-3 Financial Analysis - Benefit

Income (Benefit) 2,361,891 DH/Year
 in the First year 367,500 DH added

Fish landing commission

	Landing value(year)	Rate	Commission	Remarks
Fishery Coop.	24,606,855	1%	246,069	DH/year
ONP	24,606,855	5%	1,230,343	DH/year
Total			1,476,411	

Commission for fuel sales (L: litre)

No. of boats	Unit fuel use (L)	Unit charge/L	Commission	Remarks
2,078	120	0.2	49,872	DH/year (seiner)
27,634	60	0.2	331,608	DH/year (small boat)
Total			381,480	

Ice sales

Daily production	Unit price (DH/ton)	No. of days	monthly sale	No. of month	Remarks
4	300	30	36,000	6	high season : May to October
		20	24,000	6	low season : November to April
Ice sales (year)				360,000	DH

Rental

Facility	Unit price (DH/pc.)	Amount	Total
Fishermen locker	50	110	5,500
Workshop	3,000	1	3,000
Shops	50	10	500
G-total			9,000
Rental (year)			108,000

Other income

Facility	Income (month)	Amount	Total
Hamam	3,000	1	3,000
G-total			3,000
Income (year)			36,000

Membership fee

Unit price (DH)	No. of member	Fee	Remarks
500	735	367,500	First year only

Table 5-3-C-19 Calculation sheet of FIRR

Financial Internal Rate of Return (FIRR)							
Year	Cost	Benefit	Net Cash Flow	Discount Rate	Net Present Value	Discount Rate	Net Present Value
				6%		7%	
1	18,999,000	0	-18,999,000	0.943	-17,923,585	0.935	-17,756,075
2	550,327	2,171,178	1,620,851	0.890	1,442,552	0.873	1,415,714
3	550,327	1,931,178	1,380,851	0.840	1,159,389	0.816	1,127,186
4	550,327	1,931,178	1,380,851	0.792	1,093,763	0.763	1,053,445
5	550,327	1,931,178	1,380,851	0.747	1,031,852	0.713	984,528
6	550,327	1,931,178	1,380,851	0.705	973,446	0.666	920,119
7	550,327	1,931,178	1,380,851	0.665	918,345	0.623	859,925
8	550,327	1,931,178	1,380,851	0.627	866,363	0.582	803,668
9	550,327	1,931,178	1,380,851	0.592	817,324	0.544	751,091
10	550,327	1,931,178	1,380,851	0.558	771,060	0.508	701,955
11	550,327	1,931,178	1,380,851	0.527	727,415	0.475	656,032
12	550,327	1,931,178	1,380,851	0.497	686,241	0.444	613,114
13	550,327	1,931,178	1,380,851	0.469	647,397	0.415	573,004
14	550,327	1,931,178	1,380,851	0.442	610,752	0.388	535,518
15	550,327	1,931,178	1,380,851	0.417	576,181	0.362	500,484
16	550,327	1,931,178	1,380,851	0.394	543,567	0.339	467,742
17	550,327	1,931,178	1,380,851	0.371	512,799	0.317	437,142
18	550,327	1,931,178	1,380,851	0.350	483,773	0.296	408,544
19	550,327	1,931,178	1,380,851	0.331	456,389	0.277	381,817
20	550,327	1,931,178	1,380,851	0.312	430,556	0.258	356,838
21	550,327	1,931,178	1,380,851	0.294	406,185	0.242	333,494
22	550,327	1,931,178	1,380,851	0.278	383,193	0.226	311,676
23	550,327	1,931,178	1,380,851	0.262	361,503	0.211	291,286
24	550,327	1,931,178	1,380,851	0.247	341,041	0.197	272,230
25	550,327	1,931,178	1,380,851	0.233	321,736	0.184	254,421
26	550,327	1,931,178	1,380,851	0.220	303,525	0.172	237,776
27	550,327	1,931,178	1,380,851	0.207	286,344	0.161	222,221
28	550,327	1,931,178	1,380,851	0.196	270,136	0.150	207,683
29	550,327	1,931,178	1,380,851	0.185	254,845	0.141	194,096
30	532,327	2,069,439	1,537,112	0.174	267,627	0.131	201,926
					21,713		-1,681,399

FIRR	6.01 %
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Table 5-3-C-21 Economic Analysis - Cost (i)

Economic Analysis
Capital Expenditure (CAPEX)

Area	Facility	Scale	Unit	Unit price (DH)	Market price	Conversion factor	Shadow price
Port facilities					4,458,333		4,042,500
	Revetment	200	m	16,667	3,333,333	0.9	3,000,000
	Navigation aids	1	set	125,000	125,000	1.14	142,500
	Land	12,000	m3	83	1,000,000	0.9	900,000
Port service facilities					12,466,667		12,137,000
	Fish market	200	m2	5,833	1,166,667	0.89	1,038,333
	Ice & preservation	100	m2	5,833	583,333	0.89	519,167
	Fisheries center	430	m2	5,833	2,508,333	0.89	2,232,417
	Workshop	30	m2	4,167	125,000	0.89	111,250
	Warehouse	20	m2	4,167	83,333	0.89	74,167
	Generator	1	m2	83,333	83,333	0.89	74,167
	Drainage treatment	1	set	833,333	833,333	1.14	950,000
	Ice making plant	1	set	2,083,333	2,083,333	1.14	2,375,000
	Chilled room	1	set	1,250,000	1,250,000	1.14	1,425,000
	Connect'n&insite road	500	m	4,167	2,083,333	0.89	1,854,167
	External work	1	set	1,666,667	1,666,667	0.89	1,483,333
Equipment					666,667		760,000
	Fish handling	1	set	416,667	416,667	1.14	475,000
	Workshop	1	set	250,000	250,000	1.14	285,000
Consulting fee		1	set	1,407,333	1,407,333	1.00	1,407,333
Total					18,999,000		18,346,833

Table 5-3-C-21 Economic Analysis - Cost (ii)

Operation Expenditure (OPEX)

488,908 DH/Year

Personnel Cost

Area	Title	Unit Price(DH)	No. of person	Cost (Month)	Convers'n factor	Shadow wage
Administration	Manager	2,500	1	2,500	1.0	2,500
	Accountant	2,500	1	2,500	1.0	2,500
	Secretary	1,300	1	1,300	1.0	1,300
Ice machine	Engineer	2,700	1	2,700	1.0	2,700
	General worker	1,200	1	1,200	0.5	600
Workshop	Engineer	2,000	1	2,000	1.0	2,000
	Carpenter	1,400	1	1,400	1.0	1,400
Hamam	Worker	1,200	1	1,200	1.0	1,200
Fuel Station	Worker	1,200	1	1,200	0.5	600
Others	Security men	1,200	2	2,400	0.5	1,200
Fish market	Manager	2,500	1	2,500	1.0	2,500
	General worker	1,200	1	1,200	0.5	600
Total (month)				22,100		19,100
Total (year)				265,200		229,200

Cost of utility

Item	Use	Consumption	Unit price	Price (DH)	Transfer item	Shadow price	Remarks
Electricity	Ice machine	26	291	7,639	535	7,104	base charge (year)
		15,120	0.99	15,038	1,053	13,985	monthly use
	Refrigerator	216	1.27	274	19	255	monthly price
	Lights and others	768	1.30	998	70	929	monthly price
Total (year)				203,368		189,132	
Item	Use	Consumption	Unit price	Price (DH)	Transfer item	Shadow price	Remarks
Water	Fish market	100	5.83	583	41	542	monthly price
	Ice machine	135	5.83	787	55	732	monthly price
	Others	40	5.83	233	16	217	monthly price
Total (year)				19,239		17,892	

Maintenance and Operation Cost

facility	Cost (month)	Remarks	Transfer item	Shadow price
Workshop	500		100	400
Hamam	1,710	fuel cost	120	1,590
Ice machine	500		100	400
Building	500		100	400
Other expenses	2,000	vehicles etc.	400	1,600
Total	5,210			4,390
Cost (year)	62,520			52,684

break down	daily consump'n	15
	unit price	3.8
	no. of days	30

Transfer item means the VAT (Value Added Tax). Their tax rate are	
fuel, light	7 %
other commodities	20 %

Table 5-3-C-22 Economic Analysis - Benefit

Benefit

3,181,762 DH

	without Project		with Project		Surplus production	Surplus value	Consumer's surplus Shadow price
	Landed quantity	Landing value	Landed quantity	Landing value			
Total Landing	1,402,240	22,435,840	1,472,240	24,733,632	70,000	2,297,792	
To export						919,117	1,257,352
To domestic						1,378,675	1,654,410

Increase of landing	Increase of export	Increase of domestic supply
2,911,762	1,257,352	1,654,410

Rate of increase of landed quantity	5.0 %
Rate of increase of fish price	5 %
Percentage of export oriented	40 %
Percentage of domestic oriented	60 %
Domestic marketing factor	1.20
Shadow exchange rate	1.14

Note 1:

With the construction of fish market, more competitive price will be realized through the auction among middle men.

With the construction of refrigerator, quality down caused by the absence of refrigerator, will be controlled.

As a result, fish price is expected to increase as left (based on the interview survey at site)

Note 2:

Product is exported from Port of Agadir

Product is consumed at the market of Agadir

Ice sales

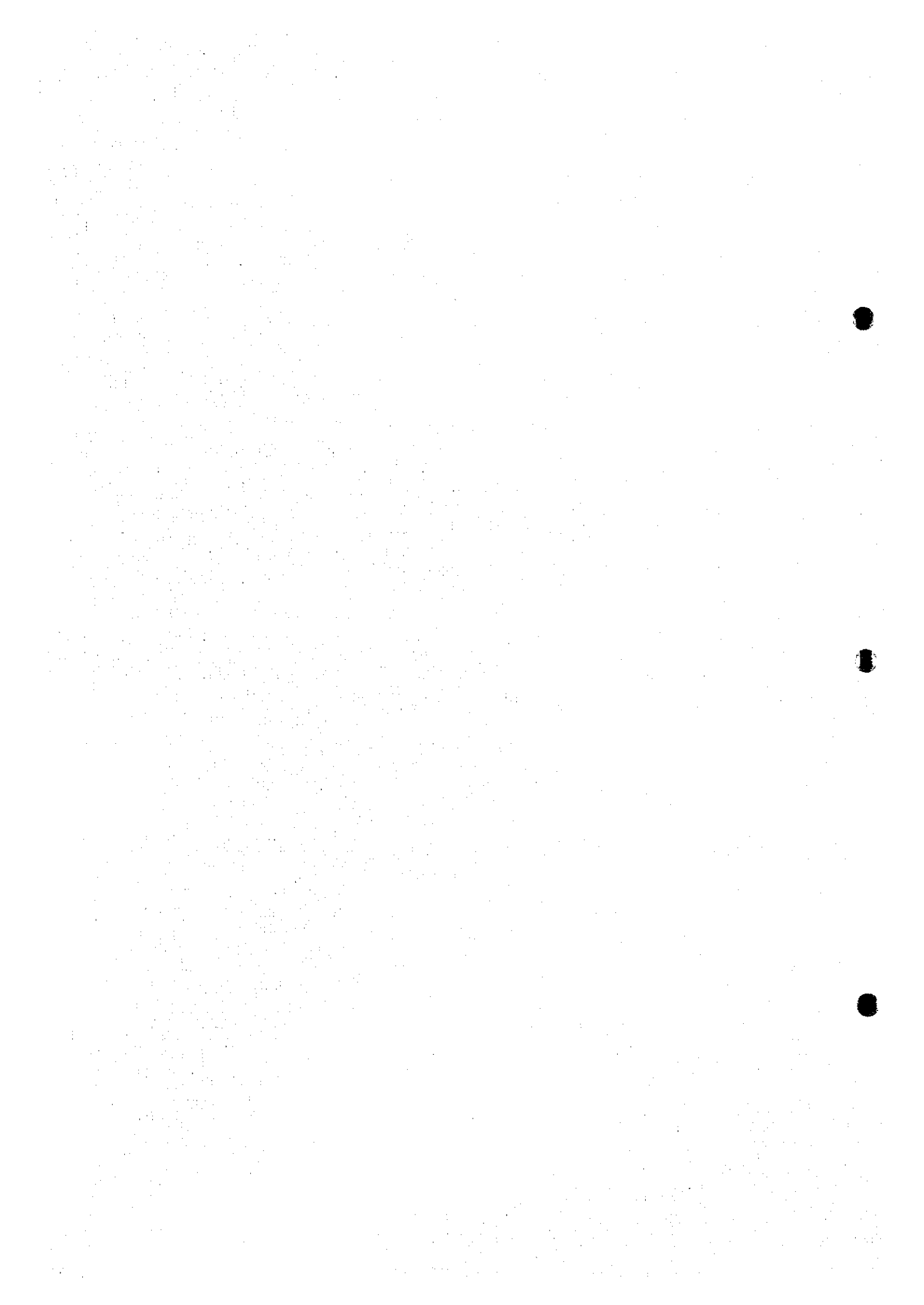
Daily production	Unit price (DH/ton)	No. of days	monthly sale	No. of month	Remarks
3	300	30	27,000	6	high season : May to October
		20	18,000	6	low season : November to April
Ice sales (year)				270,000	DH

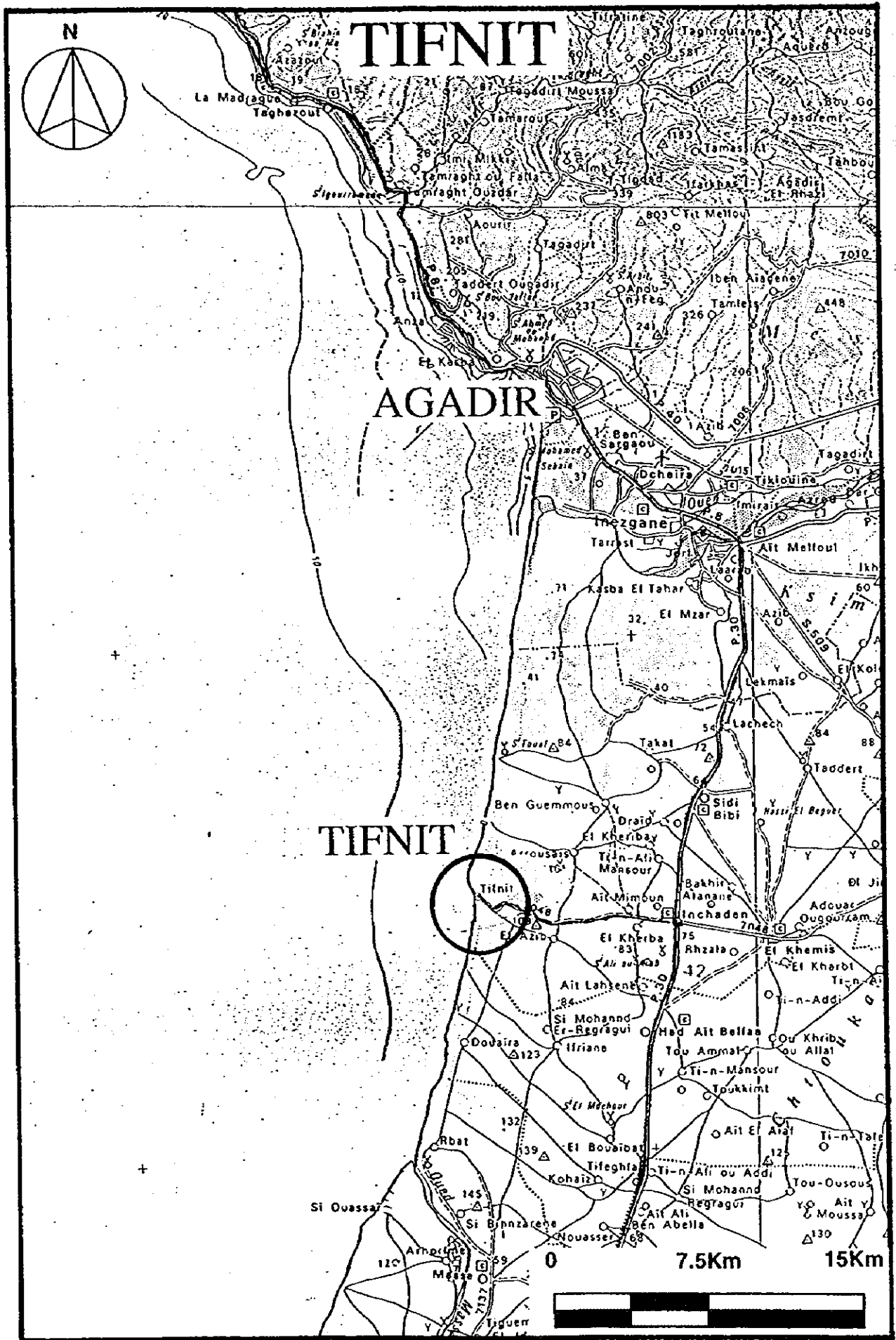
Table 5-3-C-23 Calculation sheet of EIRR

Economic Internal Rate of Return							
Year	Cost	Benefit	Net Cash Flow	Discount Rate	Net Present Value	Discount Rate	Net Present Value
				14%		15%	
1	18,346,833	0	-18,346,833	0.877	-16,093,713	0.870	-15,953,768
2	488,908	3,181,762	2,692,854	0.769	2,072,064	0.756	2,036,185
3	488,908	3,181,762	2,692,854	0.675	1,817,600	0.658	1,770,595
4	488,908	3,181,762	2,692,854	0.592	1,594,386	0.572	1,539,648
5	488,908	3,181,762	2,692,854	0.519	1,398,584	0.497	1,338,824
6	488,908	3,181,762	2,692,854	0.456	1,226,828	0.432	1,164,195
7	488,908	3,181,762	2,692,854	0.400	1,076,165	0.376	1,012,344
8	488,908	3,181,762	2,692,854	0.351	944,004	0.327	880,299
9	488,908	3,181,762	2,692,854	0.308	828,074	0.284	765,477
10	488,908	3,181,762	2,692,854	0.270	726,381	0.247	665,632
11	488,908	3,181,762	2,692,854	0.237	637,176	0.215	578,811
12	488,908	3,181,762	2,692,854	0.208	558,926	0.187	503,314
13	488,908	3,181,762	2,692,854	0.182	490,286	0.163	437,664
14	488,908	3,181,762	2,692,854	0.160	430,076	0.141	380,577
15	488,908	3,181,762	2,692,854	0.140	377,259	0.123	330,937
16	488,908	3,181,762	2,692,854	0.123	330,929	0.107	287,771
17	488,908	3,181,762	2,692,854	0.108	290,289	0.093	250,236
18	488,908	3,181,762	2,692,854	0.095	254,639	0.081	217,596
19	488,908	3,181,762	2,692,854	0.083	223,368	0.070	189,214
20	488,908	3,181,762	2,692,854	0.073	195,937	0.061	164,534
21	488,908	3,181,762	2,692,854	0.064	171,874	0.053	143,073
22	488,908	3,181,762	2,692,854	0.056	150,767	0.046	124,411
23	488,908	3,181,762	2,692,854	0.049	132,252	0.040	108,184
24	488,908	3,181,762	2,692,854	0.043	116,010	0.035	94,073
25	488,908	3,181,762	2,692,854	0.038	101,763	0.030	81,803
26	488,908	3,181,762	2,692,854	0.033	89,266	0.026	71,133
27	488,908	3,181,762	2,692,854	0.029	78,304	0.023	61,854
28	488,908	3,181,762	2,692,854	0.026	68,687	0.020	53,787
29	488,908	3,181,762	2,692,854	0.022	60,252	0.017	46,771
30	488,908	3,181,762	2,692,854	0.020	52,853	0.015	40,670
					401,286		-614,155

EIRR	14.40 %
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Tifnit





D. Tifnit

1. General conditions of the site

This site is also a sandy beach on the Atlantic Ocean. The beach has been formed at the edge of hills inland. The slope between sea and hilly zone is steep. Reef zone has been also formed in the north. The presumed population of artisanal fishermen basing in Tifnit is over 400, and that of their families is less than 3,000¹. Most of these artisanal fishermen live in the commune rurale including Tifnit, but some fishermen come from other adjacent commune rurales. The population of the residents in the whole commune rurale is about 40,000². Agriculture is largely practiced in the commune rurale. Consequently, the dependency of their income on fishing is not necessarily high. They catch squids all the year round mostly with jig. They occasionally use other fishing methods such as trammel net, bottom longline, and trolling. The income per fisherman seems to be lower than that in Saira Kedima.

1) Fisheries

(1) Overview

Tifnit is situated in an advantageous position close to the major market of Agadir approximately 40 km to the north; moreover, cliffs to the north serve to protect the beach from waves. The beach is also located close to good fishing grounds consisting of a mixture of rock and sand bottom. Local fishermen have traditionally lived in the cliff areas and practiced full-time fishing, however, newly arrived fishermen and fishermen who seasonally migrate to the site live in tents that are erected on beach slopes.

(2) Number of Fishing Boats

According to a survey made by the local design consultant CID (Conseil, Ingenierie et Developpement), the number of fishing boats based at Tifnit is put at 160. In the study surveys, 136 fishing boats were counted in February and 220 in September. Fishing boats tend to follow squid fishing grounds, increasing in number in the summer and decreasing in winter. According to local fishermen and agents, it is thought that as many as 250 fishing boats, including boats from nearby beaches, use this landing beach during the high season.

Fishing boats in Tifnit, referred to as 'flouka', are mostly small boats measuring less than 5 m in length and weighing around one or two tons. The output of outboard engines ranges between 8-15 HP but in most cases is thought to be less than 10 HP.

(3) Annual Operating Days and Operating Pattern

Concerning the operating rate of fishing boats, the CID survey estimated this to be 80% in summer and 40% in winter, however, as a result of the interview surveys and observations, the winter operating rate has been adjusted to 50% in consideration of the fact that the absolute number of fishing boats in this season decreases. The summer operating rate of 80% is considered to be appropriate.

The number of operating days is estimated as follows.

November-February	4-12 days/month (8 days) x 4 months = 32 days
March-October	20-25 days/month (22 days) x 8 months = 176 days
	Total: around 208 days

Assuming that 80% of fishing boats operate in summer and 50% in winter, the number of boats operating each day is as follows.

May-October	Maximum 250 boats x 80% = 200 boats/day
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¹ These figures are calculated based on the site researches.

² From "Population Legale du Maroc, 1994, Direction de la Statistique, Maroc".

much as 160 kg if they are lucky. Having said that, in the aforementioned survey that was conducted in 1989, since it is reported that a fishing boat caught only 600 kg of squid and 100 kg of other fish in 62 fishing trips made between April and September, it is appropriate to consider that the average catch per fishing trip in the summer is around 10 kg. It is estimated that catches increase slightly in the winter season. Dummy bait (jig) is mostly hand-made and hardly incurs any cost at all.

Trammel net fishing targets spiny lobsters and European lobster. Spiny lobsters are caught when they come to feed on fish that are left entangled in nets for around three days. Fishing for spiny lobsters and European lobster is prohibited from October 1 through to February 1. The fishing grounds are located on rocky bottom approximately two hours from Tifnit. Other types of fish caught by trammel nets are European sea bass and sole.

Gillnets are used to catch sea bream (*Pagellus spp.*), sea bream (*Diplodus bellotii*), sea bream (*Lithognathus mormyrus*), gray triggerfish and John dory; bottom long lines are used to catch mainly conger; and hand lines are used to catch dentex, sea bream (*Sparus spp.*), sea bream (*Diplodus spp.*) and conger.

(5) Quantity and Value of Landed Fish

Table 1 shows the unit prices of each fish type at the time of the September survey.

Table 5-3-D-1 Unit Prices of Major Fish Landed at Tafedna

Fish Type	Most Common Price (DH/kg)	Price Range (DH/kg)
Squid	40	40-48
European conger	7	6-7
Sea bream (<i>Sparus spp.</i>)	60	60
European lobster	90	90-110
Spiny lobsters	200	200-240
Sea bream (<i>Pagellus spp.</i>)	50	40-60
Pagre	55	55
Octopus	25	25
Rockfish	35	35
Sea bream (<i>Diplodus spp.</i>)	15	15

Here, from data obtained in the September survey, the daily quantity and value of fish landed by one fishing boat are given as 9.6 kg and 375 DH respectively. Below is given an estimate of the annual landed quantity and value calculated from the total number of fishing boat trips obtained from the monthly number of possible operating days and operating fishing boats. Comparison with September values shows almost no difference compared with survey figures from 10 years ago.

Annual landed quantity = 9.6 kg x 32,100 = 308,160 kg = approx. 308 tons

Annual landed value = 375 DH x 32,100 = 12,037,500 DH

In the winter, the quantity of fish caught in each fishing trip increases and, assuming that this increase is 20 kg in quantity and 800 DH in value per fishing trip, the increased portion in winter is as follows:

Increased landed quantity in winter = 20 kg x 75 ships x 8 days x 4 months = 48,000 kg = 48 tons

Increased landed value in winter = 800 DH x 75 boats x 8 days x 4 months = 1,920,000 DH

Therefore, the corrected annual fish catch works out to be 356 tons in quantity and 14,000,000 DH in value.

(6) Fisheries Balance

Table 2 gives a trial calculation of the annual income of one artisanal fishing boat based on the assumption that the fishing boat conducts fishing on 156 days or 75% of the current annual number of possible operating days (208 days). The annual income per fisherman, calculated by simply dividing the profit following subtraction of expenses by the number of fishermen, works out to be roughly 13,000 DH (approximately US \$ 1,400). Assuming the average size of a fisherman's family to be six members, the cash income per family member comes to a little more than US \$ 200. No consideration is given here to fishing boat damage, engine or fishing gear loss, injury or loss of life arising from unforeseen accidents and it is also necessary to take into account income made by other family members, however, although fishermen's households are practically self-sufficient in food, this income level is still insufficient.

Table 5-3-D-2 Trial Calculation of the Balance of a Fisherman Household (Unit : DH)

Revenue /Day	Revenue /Year	Annual Fuel and Bait Cost	Annual Fishing Gear Maintenance Cost	Fishing Gear Depreciation	Hull and Engine Maintenance Cost	Hull and Engine Depreciation	Profit	Profit per Fisherman
378.4	59,030	11,232	50	500	4,000	4,000	39,248	13,082.8

Note) In reality, the share of profits received by the ship owner and captain differs from that of the crew, and this ratio differs again depending on the fishing method.

Trial calculation criteria:

Outboard engines are assumed to operate for one hour per day and consume nine liters of fuel costing 8 DH/liter. Assuming fishermen only use jigs, it is assumed that annual costs of 500 DH and 50 DH are incurred respectively through having to replace lost jigs and carry out repairs.

Fishing boats are assumed to cost 20,000 DH, have a service life of 20 years and incur an annual maintenance cost of approximately 10% the purchase cost. Depreciation is obtained by dividing the cost by the number of useful years (service life). Engines are assumed to cost 18,000 DH, have a service life of six years and incur the same maintenance and depreciation costs as described for fishing boats.

2) Fisheries and Social Infrastructure

The project site, located some 25 km to the south of Agadir, is situated on a coastline that is formed from shore reefs and sand beaches. Fishermen, who live in inland communities of varying distances from the beach (up to around 10 km), conduct fisheries activities while staying overnight in fishermen's lockers. Approximately 197 ha of land to the rear of the project site has been purchased by SONABA and is scheduled to be used for resort development (construction of golf courses, summer houses, etc.) from 1998. Even now, the area is a popular destination for overseas tourists who come to enjoy surfing and other marine sports. Moreover, the surrounding coastline is visited by local families and casual fishermen at weekends and is a popular place of relaxation. Also, Massa National Park is located nearby. The sand beach on the south side of the shore reef is used as the landing beach, but fishermen sometimes lay their boats up on the high ground behind the beach at high tide and at times of stormy weather in winter.

The only existing facilities are fishermen's lockers which are grouped in steps on the south side slope behind the shore reef. In summer, fishermen from other fishing villages migrate to fish for squid, while following a camp lifestyle. In line with this trend, outboard engine repair mechanics also come to the area.

Since there is no infrastructure, agents are relied on to supply fuel, ice and foodstuffs. Power lines only extend as far as 10 km from the coast, so the fishermen's lockers have no electricity supply. Water for living purposes is pumped from a well that has been excavated within the lockers complex.

The only public facility in Tifnit is a primary school located inland, so local inhabitants need to travel 30 km to Agadir in order to receive other social services.

3) Fishing Village Society
Fishermen's Households and Housing

(1) Composition of Fishermen's Households

The average number of family members per household is 6.3, breaking down into 3.5 male family members and 2.9 female family members.

Table 5-3-D-3 Average Household Composition

Tifnit	Male	Female	Total
	3.5	2.9	6.3

(2) Form of Housing

The average area of houses is 107 m², which is practically the mid-point figure among house areas observed in all the target fishing villages. Incidentally, houses in this village also contain a small frontal vegetable garden, livestock sheds and a central courtyard. Because houses are located up to 12 km from the beach, there are some fishermen who spend long periods living in fishermen's lockers or tents on the beach.

Table 5-3-D-4 Form of Housing

	House Building Style (Number of Houses)	Distance from House to Beach (km)	Number of Rooms	House Ownership (Number of People)	House Area (m ²)	Water Supply
Tifnit	Ordinary building 21	11.96	36	Own home 14	106.5	Water supply 9
	Clay building 1			Parent's home 3		Well, etc. 13
	Barrack					Water tank 1

(3) Fuel

The facilities described herein refer to those in the small inland communities where fishermen's houses are located, not to conditions on the beach.

Table 5-3-D-5 Energy Use

	Electrification		Butane Gas Use			Firewood Purchase in Winter	
	Yes	No	Yes/No	Small Bottle	Large Bottle	Weight (kg)	Purchasing Households
Tifnit	Yes	13	Using households	18	22	83	All 3
	No	9	Average number of users				
			Number of bottles	19.33	37.09		Half 0
			Total household average				
			Number of bottles	15.82			Few 0
							None at all 2
Firewood Use							
	Yes/No	Purpose of Use (Households)	Source (Households)	Firewood Gatherers	Gathering Site		
	5	Cooking	4	Cutting	0	Adult males	0
	15	Bread making	5	Gathering	2	Adult females	1
		Heating	3	Purchase	2	Children	0
						Private land	0
						Forest	0
						Protected district	0

This question also covered fuel use on the beach, but even so firewood is used by only around 25% of the households surveyed. Even in winter, the amount of firewood used is just 83 kg, which is a lot less than in the other target fishing villages. Households and people living on the beach prefer to purchase butane gas rather than use firewood. This trend arises from the strong degree of reliance that fishermen place on agents, that is to say that fishermen borrow money from the agents to buy butane gas.

Role of Agriculture for Fishermen's Households

(1) Ownership and Benefit of Cultivated Land

All of the respondent fishermen said that they did not own fields.

(2) Field Cultivation and Livestock Rearing

No responses were received with respect to this item. Also, no data suggesting that livestock are reared could be obtained. However, donkeys used for carrying materials are often seen tethered on the beach.

Fishermen's Livelihoods

(1) Income from Fisheries and Agriculture in Fisherman Households

All year round, households only obtain income from fisheries.

(2) Crew per Fishing Boat and Distribution of Profits

Table 5-3-D-6 Distribution of Profits

Tifnit	Number of Persons Involved per Boat					Distribution of Catches						
	Boat Owner	Fishing Master	Crew Member	Personne l for Boat Transfer	Cleaning Personne l	Boat Expenses	Boat Owner	Fishing Master	Crew Member	Personne l for Boat Transfer	Cleaning Personne l	Others
Bottom long line fishery	0	1	3	0	1	25%	0%	38%	33%	0%	5%	0%
Angling fishery	0	1	2	0	0	15%	0%	47%	38%	0%	0%	0%
Net fishery	0	1	3	0	1	25%	0%	38%	33%	0%	5%	0%

(Bottom Long line Fishing)

The operating crew of a single long line fishing boat consists of one chief fisherman, three crew and one

apprentice fisherman, and this crew composition is the same in all the target fishing villages on the Atlantic Ocean side. In all the fishing boats that were surveyed, the boat owner also acted as the chief fisherman, but other cases do exist in reality.

As for the distribution of profits, after 25% is deducted for boat expenses, the boat owner/chief fisherman takes 38%, the crew members share 33% and the apprentice fisherman receives 5%.

(Hand Line Fishing)

The operating crew of a single hand line fishing boat consists of one chief fisherman and two crew, and there is no apprentice fisherman. The share of profits taken by the boat owner/chief fisherman is 2.5 times the share received by each crew member.

Hand line fishing carried out in Tifnit targets squid and is the main source of income for most fishermen. As was described in Chapter 4, even if fishermen's income is calculated by equally dividing profits among the owner and crew members of each ship, it still works out to be lower than in the other target fishing villages. Moreover, in the current situation where the boat owner/chief fisherman takes the lion's share of profits, the income of general crew members is pushed down even further. Table 5-3-D-7 shows a comparison of income received by boat owners and crew members. The ratio differs according to the fishing method that is adopted, but it can be seen that the income of boat owners ranges between 3.2 and 4.7 times higher than that of crew members.

**Table 5-3-D-7 Comparison of Income Received by Boat Owners and Crew Members
(Unit : DH)**

	Crew Members' Income		Boat Owners' Income		Crew Members : Boat Owners (Total Period Ratio)
	Monthly Average	Total Period	Monthly Average	Total Period	
Hooking	795	4,800	2,883	17,300	1:3.6
Hand Line Fishing	1,130	6,800	3,666	22,000	1:3.2
Net Fishing	943	5,700	4,500	27,000	1:4.7

(Net Fishing)

Crew composition and profit distribution are more or less the same as in the case of bottom long line fishing.

(3) Sources of Fish for Private Consumption by Fishermen and Frequency of Fish Eating

In summer the fishermen are able to obtain all the fish they need for private consumption from their own catches, but in winter boat owners can satisfy only 60% of their fish requirement from catches and crew members only 50%. As a result, boat owners must purchase 40% of their fish requirement and crew members 50%, and these purchase rates are the highest to be found among all the target fishing villages.

Table 5-3-D-8 Sources of Fish for Private Consumption

		April through October			November through March		
		Fishes from Own Catch	Purchased Fresh Fishes	Canned Fishes	Fishes from Own Catch	Purchased Fresh Fishes	Canned Fishes
Tifnit	Boat owner	100%	0%	0%	60%	40%	0%
	Crew members	100%	0%	0%	50%	50%	0%

Table 5-3-D-9 Frequency of Fish Eating

		April through October					November through March				
		Every Day	4 - 6 Days	2 - 3 Days	1 Day	None	Every Day	4 - 6 Days	2 - 3 Days	1 Day	None
Tifnit	Boat owner	0%	70%	30%	0%	0%	0%	60%	40%	0%	0%
	Crew members	0%	58%	42%	0%	0%	0%	42%	50%	8%	0%

The number of times fish is eaten per week drops by only around 10% in winter compared to summer, indicating that the frequency of fish consumption in Tifnit is extremely high compared to in the other target fishing villages on the Atlantic Ocean side.

Migration and Settlement of Fishermen

(1) Work at the Start of a Career in Fisheries

More than 90% of fishermen in Tifnit are allowed to sail on fishing boats from the very start of their fisheries careers.

Table 5-3-D-10 Work at the Start of a Career in Fisheries

	Starting Age	Starting Job	
		Crew Member	Assisting Job
Tifnit	17.7	91%	9%

(2) Migration and Settlement of Fishermen

There is very little migration to other beaches, the reason for this being that abundant squid fishing grounds are located nearby and squid fishing can be carried out all year round without having to move. Having said that, there are a few crew members who have experienced working on coastal fishing boats based in Agadir.

Table 5-3-D-11 Migration of Fishermen

		Number of Boat Transfer Instances	Average Service Years per Boat	Ratio of Fishermen with Experiences at Other Beaches	Type of Boats Experienced at Other Beaches (Percentage)		Experienced Beach (Number of Experiences, Multiple Answers Accepted)			
					Coastal Boat	Small-scale Boat				
Tifnit	Boat owner	19	19.9	0% (0/10)	-	-				
	Crew members	41	49 Beach average	25% (3/12) 4% (3/22)	67%	33%	Agadir 3			

4) Environment

1) Natural Environment

Tifnit is situated in the midst of the National Park Souss-Massa, which is sandwiched between Souss River and Massa river. Tifnit is located about 15km south of Souss River.

Bottom type of intertidal zone is reef rock with a sediment of sand. The influence of sand is the smallest in the middle of the intertidal zone. Current directs to the south near the beach (the current occasionally directs to the north in winter), so that sand impact is greater on the south side of the beach. For that

reason, it seems that the productivity of the reef on the south is lower than that on the north side. Patch reefs lower than intertidal zone is covered with relatively well-developed benthic ecosystem which is composed of such (kochakusei) animals and plants as algae, blue mussels and sea anemones. Around Tifnit, beach reefs which are covered with highly productive ecosystem is not large ranging from the reef in front of fishermen's rockers to 500~600m north.

Soil around the site is sandy, and is dominated by dry plants such as dry (sohonrui). According to a survey conducted by the national park office, it seems that the land covered with these natural vegetation is a major feeding place for Bold ibis (*Gerontic eremita*, CITES I, IUCN Redlist). The number of bold ibis is estimated at 200 all around the world. Among them, about 100 (50 pairs) have been observed in this park. Their colony in the south of the park is the biggest among those having been observed in the world to date.

2. Problems in this site 13 fishermen attended PCM workshop.

Followings are the problems which emerged at the PCM workshop. (See Problem Tree on page XX).

Similar to the previous sites, the Core Problem of the fishermen was that "their average net income (the sales of their catch after subtraction of various cost) is not sufficient. This Core Problem has been eventually leading to their low standard of living. Other important problems for the fishermen were that social security, social infrastructure and social services are scarce, although that was not their central concern. Also in this site, the problem of safety in fishing operation and navigation was critical. Furthermore, compared with other sites, the fishermen in this site complained more strongly about price control by brokers. The direct causes of the Core Problem are the following 3 items;

- 1) Sales volume of catch is not sufficient.
- 2) Selling prices of catch is low. (The selling prices of European conger and spare squid, the main fish stocks in this site, are 30 to 50% lower than those in Agadir.)
- 3) Cost of whole production is high.

These direct causes can be analyzed in light of the cause and effect relationship as follows (Also included are the important problems which are not directly connected to the Core Problem).

[Social infrastructure]

- .* There is neither portable water nor electricity.

[Social security]

- .* There is no service for fishermen such as pension and insurance.

[Fishing gears, fishing methods and navigation]

- The latest technique for navigation and detection of fishes has not been used.
- .* Access to fishing areas is difficult. (As a result, there are 3 to 5 deaths every year, one to 5 vessels are damaged, and 40 engines are missed.
The reason for this problem is that there is no breakwater, as described below).
- Rescuing operation for sea disaster has not been systematized in terms of facilities and means of communication between vessels and beach).
- There is neither lighthouse nor navigation signs.

[Services related to fishery]

- Selling prices of fishing gears are high (however, in comparison with market prices of fishing gears in Agadir, only a part of them are higher).
- Fuel prices are high (Even at the harbor which has been well treated by the government, purchase price is 2.5 DH/l, whereas the price in this site is 9DH/l).

[Fisheries resource]

- .* The resources have been endangered because of overfishing near the coast.
- Fishing places near the coast has been polluted because vessels are washed nearby .

[Fishery (production) infrastructure]

- There is no breakwater.
- There is no slip way.

[Distribution, economic system]

- Brokers bargain excessively. (The reasons for that is,)
- The number of broker is too small (There are only about 4 brokers).
- The life of fishermen is enormously dependent on the brokers' finance.
- There is no cold storage for fish catch.
- .* There is no public market.

[Conditions of the village]

- Houses of the fishermen are too far from the beach (The distance is at least 5km. More than half of the fishermen live 20km far from the beach).
- Though their houses would be built near the beach, there is no school for their children.
- There is no medical services such as hospital.

3. The direction of development

PDM has not been made for this site. However, the problems in this site seem similar to those in the other artisanal fishing villages on the Mediterranean Sea. Consequently, the approaches in the development may also become similar. Concretely speaking, it is significant to improve social infrastructure (water supply, electricity) and public services (medical care and education) as well as to promote fishery by improving harbor facilities, fishing methods, resource management, safe operation and other services related to fishing. Since the problem about sea disasters and damages on fishing gears is serious, realization of safe operation is especially significant.

There are 4 goals in the development as follows;

- 1) Improvement of basic social infrastructure (electricity, water supply, road)
- 2) Increase in selling prices of fish catch
- 3) Increase in sales volume of fish catch
- 4) Improvement of safety in fishing operation and navigation
- 5) Improvement of public services

Ultimately, the goal in the development is to improve the standard of living of the local residents in the commune. Followings are the examples of the actions which are essential to realize the above development goals.

- 1) Improvement of basic social infrastructure (electricity, water supply)
- 2) Establishment of infrastructure related to fishery production and fishery distribution
- 3) Improvement of fisheries resource management
- 4) Improvement of fishing methods and realization of safe operation
- 5) Establishment of the base for fisheries cooperative organization
- 6) Improvement of the conditions of the village (housing, school, medical facilities).

4. Action Plans by subject

1) Basic Social Infrastructure Development Plan

In view of the fact that a resort development project to the rear of the site has already entered the implementation stage and Parc National de Souss-Massa is situated nearby, it is not possible to plan the project site over a wide area for both planning and environmental reasons. Therefore, the approach will be to maintain the current fishermen's lifestyle of overnight accommodation in fishermen's lockers, while at the same time increasing the benefits to be gained from fisheries. In specific terms, improvements to existing facilities will be made, while at the same time adding various other infrastructure facilities. Concerning electricity, water supply and roads, etc., it is realistic to implement work in line with measures being taken by SONABA. Moreover, concerning the improvement and construction of roads, landing facilities and drainage ditches, etc. in the existing complex of fishermen's lockers, it is desirable in terms of operation and maintenance to advance work while utilizing the local fishermen's community.

2) Fisheries Infrastructure Development Plan

(1) Development Contents

Since the area in front of the project site is sand beach and prone to drift sand, the construction of marine facilities would be very expensive and it is best to limit development to facilities on land only. In specific terms, since the narrow nature of the sand beach means that there is a risk of landed fishing boats being carried away at high tide or when waves are rough, a slipway and boat laying-up area will be constructed to ensure that boats can be landed in safety. Also, leading lights on land will be installed to ensure navigational safety. Concerning electricity and water supply, the former will be provided via SONABA and the latter will be provided from a new well to be constructed by the same agency. Since land has already been purchased by SONABA, it is necessary to coordinate closely with respect to the access road and range of land use, etc.

Fisheries marketing facilities will consist of a fish market, ice making machine and ice storage, fisheries store room, fisheries center, workshop, kitchen facilities and fisheries-related welfare building. Consideration is also given to migratory fishermen who come to the beach in summer. In terms of layout, the facilities will be located close to the boat laying-up area.

(2) Project Cost

The cost required for the above-mentioned fisheries infrastructure development project is estimated at 25,645,600 DH.

(3) Operation and Management Plan

Of the fisheries-related infrastructure, the fish market will be operated by the Fisheries Public Corporation (ONP: Office National des Peches). As a rule, the ONP will assign two market operating staff (one manager and one employee) to mediate the sale of fish by auction between fishermen and agents, although more staff may be assigned depending on the size of catches. The staff will collect 5% of the auction price as commission for their services, and this will be the sole source of income for the ONP at the market. From the said income, the ONP will pay personnel expenses, heating and lighting expenses and market facilities maintenance costs. Moreover, 2% of the said 5% commission charge will be returned to the fishermen in the form of a social security contribution (for pensions, life insurance and hospital cost subsidization, etc.).

The other land facilities (fishermen's lockers, workshop, ice making and ice storage facilities, toilets and hamam, refueling facilities, etc.) will be operated and managed by a new body to be newly organized around the local fishermen's cooperative association. The main work areas of the new body are as follows.

- ① Landing and handling (landing of fish from boats and carrying to the fish market)
- ② Ice retailing (sale of ice for marketing purposes)
- ③ Ice storage rental (leasing of ice storage space for temporary storage of long line bait and unsold fish)
- ④ Fuel retailing (procurement and sale of tax-free gasoline)
- ⑤ Facilities rental (leasing of fishermen's lockers and the workshop, etc.)
- ⑥ Fisherman services (operation of hamam or local style showers)

The operating organization will be divided into a steering committee, to act as the decision making organ, and an executive organ. The steering committee will be composed of the manager of the DRAM in Agadir and fisherman and commune representatives, whereas the executive organ will be made up of full-time staff employed by the steering committee. As a rule, staff will be recruited from the local area, however, if no suitable human resources exist, especially to fill the specialist roles of management, accounting and ice making and ice storage engineering, recruiting will be carried out in the nearest city. It is intended for the operating body to function on a self accounting system based on income derived from the above-mentioned services.

3) Improvement of Fisheries Resource Management

Being located so close to the major Atlantic fishing port of Agadir, Tifnit is in a favorable location in terms of marketing, however, because resources are already amply exploited, there is a danger that over-fishing of demersal fish is occurring. Squid, the most important fish in this area, is a relatively safe resource in that it matures in only a year and has a fast regenerative cycle, and summer catches of squid have remained stable over the past 10 years. However, because there is a possibility that major changes could occur in the resource volume as a result of the changing coastal environment and major alterations in the natural environment (El Nino phenomenon, etc.), it will be important to give consideration to the following points in the future.

(1) Monitoring of Resources

Consideration will be given to surveys that concentrate on the spawning ecology of squid, the designation of protected nursery areas and the creation of spawning sites. Moreover, it is desirable to conduct the same activities with respect to other important fish species (spiny lobsters, European lobster, etc.). It is recommended that the INRH survey be commenced in conjunction with facility construction.

(2) Resource Management Setup

Judging from the current landing of squid, catches that are sold to agents consist of a mixture of large and small fish. When one considers that small squid, although able to grow to full size and offer the chance for new production in a few months, are traded at a cheaper price in the market, it must be said that resources are not being utilized in the most effective way. Guidance should be provided on setting prices according to size when selling to agents, and releasing small squid that are caught back into the sea (from fishing boats).

4) Fisheries Technical Improvement Plan

Existing fish gear and fishing methods are not perfect, however, since operating days will be increased and operating efficiency will be improved through the introduction of fish finders and GPS, further improvements are not considered to be required.

Since varying fishing methods is one way to stabilize artisanal fisheries, it is worth giving a try to the trawling of tuna which seasonally migrate to the local waters. There may be competition with coastal fishing boats, however, fishing grounds can be secured through placing fish aggregating devices (FAD) in outer sea waters (of depth 500 m or more).

The safety of fishing operations will be greatly enhanced through construction of the lighthouse and placement of navigational aids, etc. Concerning a rescue setup to deal with shipwrecks and accidents, it is desirable to provide a lifeboat to aid boats that capsize in the wave breaking zone near the beach, and to install fishing boats with SOS transmitters, etc. that enable them to radio for the large rescue boat in Agadir. It is recommended that the above safety measures be implemented by the time of start of facility construction.

5) Plan for Developing a Base of Fishermen's Cooperative Association Activities

The sense of unity among local fishermen is still not strong enough to allow them to exercise independent control, and the community itself is still in the formative stage. The first step required to organize the fishermen is the provision of basic social training relating to literacy education, fishing log campaigns, savings campaigns, environmental cleaning campaigns and leader training, etc. Because such activities exceed the bounds for sole supervision by MPM, it is necessary for MPM to advance them while maintaining close links with the commune rurale, ODECO and CNCA, etc. This is the wisest way to prepare fishermen for the facilities development.

6) Plan for Development of the Fishing Village Environment

Because of constraints placed on development by the environment and existing facilities, it is impossible to expand the area of the landing beach in future. However, as home to the best squid fishing grounds on the Moroccan coastline, Tifnit will continue to serve an important role as a landing beach located close to large cities. Therefore, the central theme of project implementation is to find ways to improve and complement the existing lifestyle of fishermen, i.e. working away from home while staying in fishermen's lockers and camps.

As the main pillars of development, it is necessary to develop the living environment for fishermen who camp on the beach, i.e. provide electricity, water supply and drainage ditches, etc., and to secure means of transport to enable fishermen to easily move back and forth between the beach and their distantly separated homes.

Concerning development of the living environment, SONABA will supply electricity into each household and provide common use wells in order to raise the convenience of everyday life. Common use toilets will also be provided to deter people from urinating in public. Other domestic waste water will not be crudely discharged but percolated into the ground via storm inlets. Since it is necessary to obtain the

understanding of residents when conducting these projects, ways to encourage their involvement in project planning will be sought.

Concerning means of transport, one effective method is for groups of fishermen or the fishermen's cooperative association to own vehicles and lease them out when needed.

5. Project Evaluation

1) Financial Analysis

(1) Project Cost

Concerning the capital expenditure that will be put into project implementation, the facilities construction cost is calculated based on general construction rates (tax-separate) in Morocco, and the equipment supply cost is based on local prices with respect to locally procured items and prices in Japan with respect to imported items. In addition, a consultant supervision cost equivalent to 8% of the total equipment supply cost is also taken into account. Land acquisition cost is not counted because the project site is located on state-owned land. Operating costs following the completion of facilities are calculated based on prices in Morocco. The breakdown of these costs is indicated in Table 13.

(2) Project Benefit

The effects that can be anticipated as a result of project implementation are as follows.

- ① Increased operating time
Effect gained through ice storage installation. In other words, fishermen can decide when to return to port without being limited by the activities of agents.
- ② Increased fish prices
Effect gained through realization of total competition between agents via the fish market
- ③ Improved quality of handled fish
Effect gained through use of ice
- ④ Reduction of fisheries-related expenses
Construction of the slipway will make fishing boat maintenance easier and extend the service lives of boats. Moreover, through provision of the workshop, fishing gear store and long line bait store, time that was previously spent on procuring outboard engine parts, fishing gear and bait will be saved.

Specific effects in the event of project implementation are as follows.

A. It is forecast that the annual landed quantity of fish will increase by approximately 7% from the present 333,120 kg to 356,400 kg.

B. It is forecast that average fish prices will increase by approximately 5% from the present 39 DH/kg to 41 DH/kg.

The profits which these project effects will bestow on the operating body are as follows. The breakdown of these benefits is indicated in Table 14.

① Landing commission

6% of successful bid prices at the market will be levied, 1% of which will go to the fishermen's cooperative association and 5% to the ONP.

- ② Ice sales
- ③ Fuel sale commission
For every liter of fuel sold, 0.2 DH will be levied as a commission charge.
- ④ Facilities leasing charge
Charges from the lease of fishermen's lockers, the workshop and stores, etc.
- ⑤ Other income
Canteen sales and hamam charges
- ⑥ Fishermen's cooperative association contribution
In the first year only when the fishermen's cooperative association is established, a contribution will be levied from fishermen who join the association.

Incidentally, concerning the residual value of the capital expenditure, this is not taken into account because the target facilities are largely intended to serve the public benefit.

(3) Project Profitability

It is not possible to calculate the FIRR, as is indicated in the calculation table shown in Table 15. Because the sum total of the net present value is already negative when the discount rate is set at 1%, any further calculation is impossible. In other words, even before a comparison with the long-term rate of interest is made, it is clear that the project cannot make a profit on investment.

Sensitivity analysis was carried out to find the FIRR by varying expected increase in the quantity and average price of landed fish. Three scenarios each were assumed: the landed fish quantity was assumed to increase by 4%, 7% and 10% and the average fish price by 3%, 5% and 7%. However, it was not possible to calculate a value in any of the assumed cases.

2) Economic Analysis

(1) Project Cost

Using the same cost items as those adopted in the financial analysis, only the prices are corrected, from market prices to shadow prices. In other words, concerning the capital expenditure, the facilities construction cost is multiplied by the shadow construction coefficient, and the equipment supply cost will be multiplied by the shadow exchange rate with respect to imported items and by 1.0 with respect to locally procured items. Concerning operating costs, personnel expenses are multiplied by the shadow labor coefficient with respect to unskilled labor, and transfer items such as TVA, etc. are deducted from other expenses such as lighting and heating costs, etc. Concerning the value of land that is lost as a result of facilities construction, this will not be taken into account because it is currently sandy beach not used for any particular production activities. The breakdown of these costs is indicated in Table 16.

(2) Project Benefit

The following three benefits can be anticipated as a result of project implementation.

- ① Increased quantity of landed fish (the extra amount will contribute to increasing the amount of fish exported and the amount supplied to the domestic market)
- ② Increased fish prices
- ③ Ice production volume

The value of the increased amount of fish for export is first converted to the FOB price in force at the main trade port of Agadir (domestic marketing coefficient: 1.15) and then multiplied by the shadow exchange rate (1.14). In the economic analysis, since the consumer surplus resulting from project implementation is

also treated as a benefit, the value of the increased amount of fish for supply to the domestic market is calculated by converting the price in the production area to the price in the main consumer area of Agadir market. Concerning increase in the volume and price of landed fish, the same anticipated values as used in the financial analysis are adopted. The breakdown of these benefits is indicated in Table 17.

The construction of refueling facilities, a fishing gear store and outboard engine workshop under the project will result in a cost saving benefit in that time previously spent traveling to the nearest such facilities can be saved on, however, by assuming that this benefit will translate into greater operating time and thus increased catches, it is not treated as a separate item.

Income from commission and lease charges, which is taken into account in the financial analysis, is not considered in the economic analysis since it is viewed as domestic transfer of services.

(3) Level of Priority of the Project

The EIRR is 6.18%, as indicated in the calculation table shown in Table 18.

Sensitivity analysis was carried out upon correcting the quantity and average price of landed fish following project implementation in the following way.

Table 5-3-D-19 EIRR Sensitivity Analysis

Increases in Landed Quantity	Increases in Average Fish Price	FIRR
4%	3%	Incalculable
	5%	3.21
	7%	5.26
7%	3%	4.18
	5%	6.18
	7%	8.02
10%	3%	6.90
	5%	8.76
	7%	10.52

Since it has been decided that full-scale fishing port facilities are not required in the project and construction is limited only to land facilities, the capital expenditure is greatly reduced, and this translates into a high EIRR value in the calculation. Indirect items that cannot be measured in money terms are the ripple effect on tourism and other local industries, employment creation, improved convenience of fishermen's camp life, better access to the nearest cities, and so on. Moreover, as a result of being able to enter the social security system through selling catches via the ONP, fishermen will have a greater sense of security in their daily lives.

3) Environmental Impact Assessment

(1) Natural environment

There are many uncertain factors in this project. One reason is that a project by SONABA is still under way at this site. The way how this project should be related to that of SONABA has not yet been clear. In any case, it is significant to consider the impact of the project to Bold ibis, because they are designated as endangered species. The followings are the impacts which might occur.