

V-1 BIMA PRIORITY ZONE

Model Sites: Rompo and Bima Retail Market

1. Background of the Bima Priority Zone

1.1 Situation of Priority Zone

1.1.1 Natural Conditions

(1) Conditions Surrounding the Location

Bima district is located in the easternmost region of NTB Province. Its north side faces Flores Sea and the south side borders the Indian Ocean. Its eastern side borders Sape Strait, and Komodo Island is sandwiched between the district and Flores Island. The mouth of Bima Bay faces the Flores Sea and the district capital, Bima, is located along the bay coastline. Waworada Bay opens out on the Indian Ocean, where Rompo village, which is the second largest fish landing site in the district, is located.

The Rompo site is located in the Rompo village, Langgule district, which is a fishing village located on the bay's northernmost coast. It serves a focal role among the several villages scattered along the coastline. With the exception of the mouth of the bay, mountains surround all three sides of Waworada Bay. Subsequently, the bay waters are relatively calm. Although the village is separated from Bima city by a mountain range with an altitude ranging from 500m to 700m, there is a paved road which connects the two areas. Bima market is located in the district capital, Bima, and it is surrounded by commercial, residential and harbor districts where various urban functions are concentrated.

(2) Weather Conditions

Weather records in Bima district show that the area has a dry season from May to October and a wet season from November to April. The average monthly temperatures range from 25° to 28°C and the highest temperature throughout the year is consistently 30°C. However, the lowest temperature that occurs during the dry season falls below 20°C. The annual maximum humidity rate is 70 percent during the dry season and 90 percent during the wet season, and the disparity is high in one year. The monthly average number of rainy days during the wet season is about 20 days and 0 to 3 days during the dry season. The average monthly rainfall volume during the wet season ranges from 200mm to 300mm and falls to less than 20mm during the dry season. The average annual rainfall volume is about 1,500mm.

The number of rainy days at the Rompo site is nearly identical to the district average, but the average annual rainfall volume is about 1,900mm, which about 400mm higher than the district average (see Table 7-1-1, Appendix 7).

(3) Topographical and Geographical Conditions

The average water depth of Waworada Bay is about 50m, but the water depth at the mouth of the bay is deep at 100m to 200m. The bay faces southeast and although it is affected by the rough waters produced by the southeast monsoon; it is protected from the rough waters of the Indian Ocean. The ground is hard and there is no flat land area since the mountains borders the coastline. Waworada is a small flat basin located between the mountains and the coastline. Several village settlements are located on the beach.

Ocean depth measurements show that the topography of the inter-tidal zone is flat and the ocean bottom is exposed nearly 200m offshore from the coastline during ebb tide. The ocean bottom contains a thin layer of accumulated weak sandy soil covering the bottom coral soil.

The head of the 200m long, rocky embankment that was built in 1943 by the Japanese army becomes evenly exposed during mid-tide. Therefore, it is deduced that the basic foundation is firm. The mountainous side of the arterial road that runs along the coast is base

rock and the coastal village settlements have been built on sandy ground.

(4) Ocean Conditions

Both Bima and Waworada bays are enclosed bays and their waters are tranquil. Due to the south-eastern monsoon winds, waves form near mouth of the bay during the months from November to February. To avoid these waves, many of the fishing boats moor their boats on the east side of the old rocky embankment built by the former Japanese army. The simple rocky breakwater that was built to protect the fisher's houses located on the beach from the waves regularly gives way (two to three times a month). During the months of the north-western monsoon winds from July to September, the mountains at the rear cut off the winds entering the bay. As a result, the HWL tidal level in Bima (Bima Bay, Tanjung) drops to +1.18m, but rises to +2.90 in Rompo (see table below). The seabed at Rompo is shallow. Although fishing boats can approach the wharf during high tide, the seabed is exposed for 200m offshore during ebb tide, which greatly impedes fishing activities. The differences in the tidal level between the northern and southern coastal areas are great throughout the region from Sumbawa to Flores islands.

Site	Fluctuations in the Tide Level			Source
	LWL	MWL	HWL	
Rompo	±0.00	+1.45	+2.90	On-site ocean depth measurements
Bima	±0.00	+0.59	+1.18	On-site ocean depth measurements

(5) Land Usage Conditions

The Bima market site that is located on government land is presently an open lot. Urban renovation is underway from the central part of the city to the existing retail market and coast, which are surrounded by residential areas.

The Rompo site is a flat land area of about 3ha located on the ocean side of the arterial road that runs along the mountains. It is comprised of 311 households and a concentrated population of 1,358 residents. Fisheries households dominate the coastline. The majority of the houses have raised floors, and the space under the homes is used to store fishing equipment and to build or repair small fishing boats. The village roads run crisscross, and although the residential and public areas are divided, there is no land area for public or fishery activities. In addition, since the entire village community is located in a low land area, the village roads and the areas under the houses are flooded during the south-eastern monsoons.

Sunday markets are held along the arterial road at the Rompo site. About 200 stalls are set up and Waworada Bay is crowded with residents from the neighboring fishing villages and from Sumbawa and Flores islands. This impedes the daily life pattern of the village and aggravates traffic conditions.

1.1.2 Social Infrastructure

(1) Road Traffic Conditions

An airport and harbor (commercial port) is located in Bima District and a widespread transport network, including bus terminals throughout the city, exists. There is also a commercial harbor and ferry port in the eastern section of Sape district that connects to Flores Island and serves as an east-west transport base.

The national arterial road in the district runs from Bima city, through Sape to the Dompu and Sumbawa districts in the west. The road running between Bima and Sape is paved and is adequately maintained. But the road between Bima and Waworada is paved, but

is inadequately maintained. The road that runs from Bima city through the mountains to Boro is also in good condition, but the road that runs through the mountainous area from Boro to Waworada is unpaved with holes and it is poorly maintained.

The arterial district road that runs through the Waworada village communities is not only an important means of transport, but plays a significant role in the daily lives of the residents and their fishing activities. But the road is unpaved and the demarcation between the road and private areas is unclear. The village roads crisscross, but they are unpaved and due to the lack of gutters, sanitation conditions are poor. In addition, since the ground level on the ocean side of the village road is low, it is flooded during the high tide. Therefore, the road is not fully functional.

Due to the lack of roads connecting Waworada with the coastal fishing villages, ocean transport is the major means of transport. Waworada serves as the starting point for transport boats that connect the fishing villages. However, due to the lack of mooring facilities, it is forced to moor during the ebb tide at the rock embankment built by the Japanese army. During the high tide, it picks up and delivers passengers and cargo at a simple scaffolding constructed along the main road. Data on the transport boat based in Rompo and its operations is shown in the table below.

Transport Boat Operations		
Destination	Number of Boats in Operation	Number of Trips
Soro Afu, Ropa	5	1 trip/boat/day
Sambada, Bali	3	1 trip/boat/day
Soro Peto	2	1 trip/boat/day
Karampi, Mamba	11	1 trip/boat/day
Nanganiu	5	1 trip/boat/day
Sido	6	1 trip/boat/day
Total	32	32 trips/day

Note: Each transport boat is L=12m B=2.5m capacity to transport 12 people maximum 20 people

Source: On-site interview survey findings

(2) Condition of Public Facilities

Although public facilities exist in Bima district, a small TPI along the arterial road is the only public facility in Rompo. The town hall and primary school is located in the adjacent village and the junior high school that is owned by the sub-district office is located in Karumbu village. There is no meeting hall for fishermen and meetings are held at the TPI or out on the road.

Data on the electricity and water supply in Rompo is shown in the table below. The power and water supply in Bima city is functional. Although the electric power supply is constant in Rompo, the water supply is problematic due to the lack of a water supply facility, and the residents are forced to buy drinking water from the adjacent village. The water from the communal wells in the village is unsuited as drinking water due to the high saline concentration.

Electricity, Water Supply and Telephone Communication			
Site	Electricity	Drinking Water	Telephone
Rompo	Power supply from the PLN (24hr)	No water supply facility. Drinking and household water is bought from the adjacent village. Three public wells in the sub-village	Telephone facility is functional
Bima	Power supply from the PLN (24hr)	Water supply from PDAM. Installation of a 4 inch water pipe along the road at the plan site	Telephone facility is functional.

1.1.3 Fishery Related Facilities

The only major existing fishery facilities in Bima district is the PPI. A private ice-making plant (block ice: 10 tons/day) is located in the Bima Bay area, which produces ice for industry use. In addition a PPI Tanjung will be constructed adjacent to the water area by the District Fisheries Office.

A TPI was established in the sub-village of Rompo that functions as the focal center for fisheries activities, but it lacks basic fisheries related facilities such as mooring facilities for fish landing activities, a fish handling/auction hall, ice-supply facility, processing facility, and others. Due to the lack of land space, fishing boats and equipment are repaired either under the fishermen homes or aboard the boat.

1.2 Fisheries Conditions

1.2.1 Overview of Fishing Village

Rompo Bay has been designated as an administrative district and it is located in the sub district of Langgule in the Bima district. There are about 9,000 households (population 38,000) in Langgule, which is about 9 percent of the total population of Bima district. It is comprised of nine villages, of which seven are fishing villages. There is a particularly large fishing population in the three villages of Rompo, Karumbu, and Karanpi. Fishing villages are also found in Laju, Doroo, Rupe, and Kanga. The majority of the fishermen are ethnically Bima, but there are other ethnic villages of the Bugis and Bajou tribes that originate from south Sulawesi.

Rompo village, which is located in the center of this sub district, is the model site that has been selected in this pilot study. It is about a 1.5 hour drive from Bima, the district capital, and about 2 hours distant from the district's foremost fish landing site. Waworada is also linked to Sumba Island (NTT Province) by a 20-ton cargo boat that operates once a week between these two locations. Salted fish (Pindang Selepi) and other fishery products are shipped to Sumba Island from Waworada and dried palm leaves that are used to prepare the salted dried fish, is imported from Sumba Island. Sumba fishermen occasionally purchase used purse seiners at Waworada.

A summary of the three major fishing villages bordering Waworada Bay is shown in the table below.

Administrative Village	Fishermen Village	No. of RT	No. of Fishermen Households	No. Fishing Groups	No. of Women Groups	Fishermen Cooperatives (no. of members)	Remarks
Waworada	Rompo	5	311	1	-	1 (184)	Bima (purse seine, gill net)
	Waworada		(Shrimp culture farms)				Bima (shrimp culture)
Karumbu	Rimba/Bugis	2	114	1	-	-	Bugis (Bagan, angling)
	Soro Afu	4	232	-	-	-	Bugis (Bagan, angling)
Karanpi	Karanpi/Siro	3	125	-	-	-	Bima (gill net, angling)

Source: Bima District Fisheries Office, Langgule sub district office

1.2.2 Fishing Activities

(1) Major Fishing Methods and Fishing Boats

The major fishing methods that are used in Waworada Bay (by motorized fishing boats) are Bagan or lift nets (40 boats), purse seine (44 boats), gill net and bottom long line (14 boats). Bagan fishing is conducted in the coastal waters of the bay at night and gill net fishing is carried out in the middle waters of the bay during the day. The different fishing methods are used in stipulated waters areas in the bay and disputes over water areas do not occur. The majority of the Bagan fishing boats are based in Rimba village located a few kilometers east of Rompo village. Most of the boats are large and range from 20 to 40m in length and they are equipped with fish lamps and power generators. The fish catch of most of the Bagan boats is purchased by fish collection boats, (length 89m, 25 boats) which are based in Rompo, at sea during the night. The Bagan fishing boats set their nets several times in one night. The final catch is brought back to the village at dawn for self-consumption or sold to dried fish processors. In contrast, purse seiners are all based in Rompo and land their fish catch there.

Fishing operations utilizing the fish aggregating device (FAD) that is commonly seen in the coastal waters of Flores Island are nonexistent in Waworada. Based on observations of groups of purse seiners operating during the day and the fact that the fish size of the catch is relatively large in comparison to the fish catch in Bima Bay and Chempi Bay (Dompus district), it is surmised that the pelagic fish resources of the bay are relatively in surplus.

(2) Fishing Boat Operation Patterns and Fish Landing Volume

Data on the fish landing patterns of Rompo village, a major fish landing site in the bay, is nonexistent. Based on the survey findings of this study, the fishing patterns according to major fishing boats were projected as shown in the table below (see Appendix 1).

Fishing Boat	Period	Unit of Fish Volume (kg/day/boat)	No. of Fishing Boats	Fishing Efficiency	No. of Boats in Port	Fish Landing Volume (ton/day)	No. of Fishing Days (days per month)
Bagan (power generator)	July-Feb	300	22	0.60	13 (1.2)	0.66	25
	Mar-June	600	(2)				
Bagan (fish lamps)	July-Feb	150	18	0.60	11 (0.6)	0.27	25
	Mar-June	300	(1)				
Purse seine	Jan-Mar	200	22	0.34	7	1.49	19
	April-June	300				11.62	
	July-Aug	400	44	0.88	39	15.50	25
	Sept-Dec	300				11.62	
Gill net-Bottom long line	Nov-April	15	14	0.72	10	0.15	25
	May-Oct	30					
Fish transport	July-Feb	220	25	0.85	21	4.67	25
	Mar-June	440					

Note: The direct fish landing volume of Bagan fishing boats was estimated at 1/6 of the fish catch (5/6 of the catch is sold to fish collection boats).

The peak fishing season in Waworada Bay is from March to June for Bagan boats that land small pelagic fish, from June to September for purse seine and gill net fishing, and from September to March for bottom long line and angling for demersal fish. The fish catch volume is large during the months of April to August and decreases from January to February (see Figs. 1-2, Appendix 1). Although the waters of Waworada Bay are unaffected by the

northwestern monsoon and the number of potential fishing days does not change throughout the year, the volume of pelagic fish drops in the bay from January to February due to the heavy rainfall volume. Subsequently, the number of purse seiners decreases by 50 percent (22 boats) yearly from January to March when the boats move to the fishing grounds in Sape Strait or Sumbawa (Alas Strait) where fishing efficiency increases. In addition, the waters at the mouth of the bay become rough from April to August during the southeastern monsoon season, and it becomes difficult to fish in the open sea. But, excluding this season, some purse seiners fish outside the bay. This is a good indication that there is potential to diversify the fishing grounds in future.

(3) Fish Species

The three major fish species that are harvested in this region are anchovy, sardine, and round scad, which comprise about 60 percent of the total fish catch volume. In addition, fusiliers (12%), and frigate tuna (6%) are mainly harvested by purse seine and gill net fishing, and large migratory such as marlines, bonito, tuna, and Spanish mackerel comprise 13 percent of the overall total volume. In addition, cuttlefish (4%) and demersal fish species (5%) are landed by bottom long line and angling. A diversity of fish species is harvested.

(4) Procurement, Repair, and Replacement of Fishing Equipment

Much of the fishing equipment and materials that are needed can be purchased at the retail store run by the KUD Mina Teluk Waworada. However, occasionally the store is out of stock and some parts must be bought in Bima. Despite the lack of a machine repair workshop in Rompo, there are three mechanics, who repair engines and provide maintenance services at their homes or outdoors. The restricted workspace, limited tools, and the effect of rain and sunlight on work conditions are problematic.

1.2.3 Fish Marketing, Processing, and Shipping

(1) General Conditions

The three major fish landing sites in Bima district are Sape, Bima, and Waworada and the fish catch is mainly shipped and sold in Bima, the district capital, the surrounding retail markets, and in the inland villages along the transport route. Much of the fish catch landed by Bagan fishing in Waworada Bay at the beginning of each month is sold in the inland regions and fresh fish shipment to the Bima and Sape markets are reduced. About half of the fish catch harvested during the peak fishing season is salted and dried. Sape is the major production site for salted and dried fish. Anchovy and round fish are processed from June to October; cuttlefish is processed from October to February. The processed fish is shipped to Dompu and Sumbawa districts, as well as remote eastern Java.

Waworada is the second largest fish landing site following Sape district. The fishing seasons are identical to Sape and Bima, but the fish catch is mainly composed of small pelagic and large migratory fish. Hence, in terms of fish marketing, the fishery resources at Waworada are better than other fish landing sites.

(2) Fish Transactions

There are five auctioneers at Rompo who formerly negotiated transactions between the fishermen and the traders and retailers at the public auction market, Tempat Pelong Ikan (TPI), which is no longer functioning. Presently, the fish catch is taken from the fishing and transport boats to the beaches near the TPI by sampans. It is landed near the fishermen houses that are clustered near the beach and negotiated and sold to the waiting traders and retailers there. The fresh fish that are marketed in the district (sardines, round scads, and other small

pelagic fish species) are sold in basket or tubs in units of 30kg to 35kg. But bonito, tuna, fusiliers, frigate tuna and other demersal fish are sold as catch in number. However, the small pelagic fish, halfbeak, is also sold as catch in number. Salted and dried demersal fish for export are sold by shippers in kilogram units.

(3) Fish collectors

Based on the findings obtained from the survey conducted by this study in February 2002 (during the lean fishing season), fish transactions at the site are carried out by an average of 26.3 retailers and fish traders per day that may rise to a maximum of 42 people. In a breakdown according to ratio, two-thirds of the entire group is comprised of small retailers who transact less than 100kg per day and mainly sell their fish directly at the market. Moreover, two thirds of the traders and retailers are women. In addition to women from the local fishing villages, traders from the neighboring inland suburbs of Bima (Sila, Tente, Ngali, Renda) come in to engage in fish wholesale and retail activities. In a ratio breakdown of the volume of fish transacted, nearly one-third of the total volume was sold by retailers handling less than 100kg of fish. Much of the fish is sold by traders to retailers in the Bima market. During the peak fishing season, about 100 traders and retailers are estimated to sell approximately 11.2 tons of fresh fish per day (see Figures 1-5, Appendix 1).

Three local collectors transact demersal fish for export. The fish is packed in ice in insulated boxes at their homes and sold to regular contracted buyers. These buyers freely supply the ice. The volume of exported demersal fish that is shipped is estimated at 60 tons/year (200kg/transaction x 3 collectors x 2 transactions/week x 50 weeks).

(4) Fish Processing

The majority of the small pelagic fish is salted and dried. Frigate tuna, fusiliers, bonito are processed as Pindang Selepi, a salted and dried specialty fish product of Rompo and Hu'u (Dompu district). The peak processing season is the dry season. Although the impact from rain is minimal, the price is cheap since it coincides with the peak fishing season of the neighboring areas. In addition, the processing is inadequate since it is dependent on family labor and the processing plant during the peak fishing season and the quality of the product drops. The ratio of fresh fish that is marketed or processed is estimated at 57 percent and 43 percent, respectively. However, it is also estimated that about 10 percent of the fish landing volume is not sold, producing an economic loss (see Appendix 1, Figures 1-11).

(5) Fish Price

The beach fish price fluctuates according to the month and fishing season and greatly affects the volume transported to Bima market. Fish is shipped to Bima market from Sape Strait, Bima Bay, Saleh Bay (Kempo) in neighboring Dompu district, in addition to Waworada Bay. Bagan fishing is mainly carried out in these areas. Hence, the fish catch volume is large at the beginning of the month, which contributes to a large drop in the fish price. Seasonally, the fish price is very cheap from July to August, and is expensive from November to March during the rainy season when fish catch is minimal and processing is restricted (see table below).

Major Fish Species	Peak Fishing (months)	Share	Unit	Transacted Price (Rp.)	Price per kg (Rp.)
Anchovy	3-6	24%	Cage (35kg)	80,000-110,000	2,200-3,200
Sardines	3-10	18%	Cage (35kg)	15,000-40,000	500-1,200
Round Scads	3-10	17%	Cage (35kg)	35,000-60,000	1,500-3,000
Fusiliers	6v9	12%	individual(3/ kg)	1,500-2,500	4,500-7,500
Frigate tuna	6-9	6%	individual(3/ kg)	700-1,500	2,100-4,500

1.2.4 Mariculture

(1) Culture Conditions

Seaweed culture undertaken by fishermen and pearl culture by three private companies are carried out in Waworada Bay. Specifically, seaweed culture is carried out at the Soro Afu sub-village on the opposite bank of the Rompo sub-village model site and the Gerampi sub-village located near the mouth of the bay. Pearl culture is also conducted in Gerampi in the waters near the mouth of the bay. In addition, prawn culture is being developed in an area of about 400ha (818 ponds) in the inner area of the bay. Of the 818 ponds, the district Fisheries Office has built 121 ponds as part of an assistance project. A cage culture assistance project to produce artificially hatched grouper fries is also being implemented in Sape Bay by the District Fisheries Office. A private company is implementing a stocking project in four locations in Sape Bay, but this type of cage culture is nonexistent in Waworada Bay.

There are about 200 households in the sub-village of Soro Afu. The District Fisheries Office provided technical guidance in seaweed culture in Soro Afu in the past, and presently, seaweed culture is conducted in Kelompok (66 members). However, these members are engaged in seaweed culture in conjunction with their fishing activities.

(2) Characteristics of Seaweed Culture in Soro Afu

Seaweed culture conducted in the sub-village of Soro Afu was initially started using rafts. However, due to their limited durability and expensive construction cost, many of the fishermen have switched to long lines. All the materials needed to build long lines can be purchased in Bima. The cost of constructing one 35m² long line is about Rp 70,000., and its lifespan is about five years. The number of long lines that are used in seaweed culture is about 30 to 50 sets per household, and the initial investment cost is about Rp 200R to Rp 350. There is no cost generated for the natural seed used in the culture since it is harvested locally.

Although differences exist between fishermen households engaged in seaweed culture, the yield volume of dried seaweed is about 200kg/50 sets per household. International prices affect the price, which ranges from Rp1,500 to 3,500/kg. The average price is generally about 2500Rp/kg. Therefore, to recover the initial investment cost, the seaweed must be harvested about seven times.

After the product is dried, it is sold to the distributor in the village. But the fishermen retain to the right to decide whom he wants to sell the product to and it is usually sold to the distributor with the highest buying price. The product is then sold to a distributor in Kalodu village via Rompo on the opposite coast.

The seaweed is cultured along the beach in front of the village, but the village residents are permitted to freely set their rafts or long lines. Presently, there is ample room for culturing and disputes over the use of water area have not arisen.

(3) Issues

Although seaweed culture technology has been adequately transferred to the fishermen in this area and there is ample water area to sustain culture activities, the initial investment cost per household is expensive. But since it is possible to borrow the initial capital from the existing credit system, a financial system will not be introduced in this plan.

The water depth and tranquil wave conditions of Waworada Bay make it ideal for feed culture of groupers, but due to the pearl culture activities that are conducted near the mouth of the bay and which require clear water quality, Plans to begin feed culture at this

time are not feasible, since feed culture tends to pollute water quality. Therefore, plans to develop feed culture should only be initiated after the location and size of potential culture sites have been pinpointed based on a scientific study of the seabed topography and the water flow within the bay, in addition to the establishment of mutual consensus between the local residents and the pearl cultural businessmen, and the enactment of laws and regulations on water usage rights. Hence, plans to develop feed culture have not been included in this study.

1.3 Fishermen Organization, Fisheries Credit, Fisheries Extension, Education/Training and Community Living Environment

1.3.1 Fishermen Organization and Fisheries Credit

(1) Fishermen Organizations

The model site, Rompo in Bima district, has only one village-level fishery cooperative (KUD Mina Teluk Waworada) with 184 members, of which 75 percent are fishermen. It was initiated and formed in 1984 by government on a top-down approach with a capital of about Rp 100 million as launching fund for credit operation, which the cooperative had to pay back in three years at an annual interest of 16 percent. According to its annual report for 2000, it had a profit of about Rp 8.0 million, membership deposit of Rp 2.1 million, and savings (regular, voluntary and compulsory) of about Rp 6.0 million. The cooperative's current business activities are savings/credit (main) and kiosk operation.

A workshop was conducted in Rompo to grasp the needs and expectation of the community on the planned fishery development programmes and to explain the need for self-reliance through community-based management. It was attended by more than 40 people comprising village heads, members of cooperative, fishermen, fish traders and processors, fisheries officers, etc. The participants indicated that the existing cooperative is not serving them in providing their needs such as fishing inputs, new fishing techniques, and other services; as a result many do not feel the need to become members. In addition, the cooperative does not have a good image among the community due to lack of management and business skills, transparency in accounting, and distrust of the board members.

The participants in the workshop accepted the concept of self-management and expressed their willingness to participate, and agreed to support the implementation of the planned programmes. As fishermen and traders realize that the activities will stabilize fish price, establish a guaranteed market and improve fish quality, they are willing to pay for the use of the facilities and services provided. They also strongly disapproved entrusting the role of management and operation to the existing cooperative, and agreed to work in solidarity by organizing themselves and to take responsibility to operate and manage the planned facilities and equipment. They admitted that they are weak in business management and knowledge; they are willing to be guided and trained and to employ an able person with business and managerial skill for day-to-day management.

Fishermen in Rompo knowing that the existing cooperative with members comprising of fishermen, traders, farmers, teachers, etc. is not successful in their area, nor did it emerge as a viable form of organization, they have initiated to form an association to accommodate diverse interests of the community using the Waworada Bay. The association will be formed according to the existing rules and regulations and it emphasizes on the consensus of the members in the position of board members and clear role of the members or the association and the government in the management of the basic and functional facilities.

(2) Fisheries credit

The credit activity of the fisheries cooperative (KUD Mina Teluk Waworada) is one of the financial sources available to member fishermen to cover the immediate needs such as fishing operation. It provides small credit only to members of the cooperative at a monthly interest rate of 3 percent (annual interest at 36%) which is relatively high for fishermen. The cooperative extends only small credits as it does not have a large pool of group savings or capital to extend large amount for investments. Its credit fund is mainly from the interest payments and savings (regular membership and voluntary savings).

Bima district is a recipient of PEMP fund, a special fund to assist poor coastal artisanal fishermen; Bima has received a total of Rp 600 million for the year 2001. However, Waworada was not selected for disbursement of the fund. Some 23 groups (13 fishing groups, 6 fish traders and 4 tambak groups) were selected elsewhere to receive this line of credit.

1.3.2 Fisheries Extension, Education/Training

Field extension activities is administered and conducted by the Education, Training and Extension Agency (BPLLP) of the Agriculture Department. According to the Food Security and Agricultural Extension Office (Badan Ketahanan Pangan dan Penyuluh Pertanian), the provincial or district fisheries offices are not formally charged with the responsibility of extension activities. However, most of the activities conducted by the provincial and district fisheries office are considered extension and training activities. Provincial fisheries office also conducts extension and training in consultation with the district fisheries office. Hence, on basis of requirements and budget availability the district fisheries office conducts extension and training. Bima district fisheries office plans extension and training activities and proposes for annual development budget. In 2001 it has conducted extension/training on fisheries business, regulation of business permits, production techniques, and empowerment of coastal community with their fisheries staff.

1.3.3 Community Living Environment

The houses in the Waworada fishing village have raised floors and are clustered along the narrow and flat coast. The livelihood of about 97 percent of the households is dependent on fisheries (supplementary income is derived from seaweed culture). The issues related to improved living standards that were pinpointed in the workshop on fishing village environmental improvements that was conducted in the village are explained below.

Items	Existing Conditions
1) Water shortage	<p>The shortage of drinking and household water is a serious problem in the daily life of the fishing village. Although there are three shallow wells in the village, the water is undrinkable due to the high saline content. Drinking water is sold in plastic containers at the adjacent village 2km away. The cost of a 20-liter container of water is Rp300 to Rp350. One household consumes about 100 liters of water per day, and the monthly cost for drinking water is about Rp50,000 to Rp100,000, which places a large financial burden on the household budget.</p> <p>During the rainy season, the village residents are transported to a nearby river by a bemo (small passenger van) to collect household water (usage time is about 5 minutes and the roundtrip cost by bemo is Rp2,000). During the dry season, washing and bathing is done using seawater, and drinking water is used for the final rinse. The time used to procure household water is another burden for the villagers.</p>
2) Poor Wastewater Disposal and Outflow	<p>Due to the narrow and unpaved road in the village, drainage has not been installed. As a result, the village is very damp and the water flow is inadequate.</p>
3) Toilet Shortage	<p>There are no public toilets. About 87 percent of the houses do not have toilets and the villagers use the ocean near the fish landing site to meet their needs. This is hygienically inappropriate since fish transactions and processing activities are conducted in this area.</p>

4) Unregulated Garbage Disposal	The villagers dispose their garbage around their houses or in the nearby ocean since rules on garbage disposal are nonexistent. Garbage that is thrown out in the sea is brought back to the area by the waves, and the nearby ocean is littered with accumulated garbage.
5) Electricity, Cooking	Electricity is supplied 24 hours of the day. A few of the more affluent households use kerosene as cooking fuel, but the majority of the households use firewood collected from the coastal mangroves.
6) High Primary School Dropout Rate	Parent awareness about the importance of formal education is limited and the ratio of children who dropout of primary school is high (about 10 percent according to interview survey findings).
7) Lack of Community Activities	The knowledge needed to improve the living environment of the village is meagre, compounded by the lack of information access to other community activities. This has led to a lack of self-motivation to implement activities to improve the situation (with the exception of community cooperation for funerals and weddings, shared activities involving clean water management, sports and other recreational activities are nonexistent).

1.4 Development Issue

- a) To cope with the increasing local and the export demand, the fishing activities that are concentrated in the inland waters must be disseminated to resource abundant water areas outside the bay, in order to stabilize an increased, sustainable production volume (for all water areas)
- b) Measures to strengthen the educational and training activities for young fishermen, especially the shift from Bagan fishing to alternative fishing methods will be targeted; the development of mariculture as a supplementary source of income for small-scale fishermen will be promoted; and a sustainable fisheries resources management system in the bay will be created (for all water areas).
- c) Diversify and improve the quality of processed fishery products and increase the export volume to the outside regions of Java, Bali, and Lombok.

2. Contents of the Plan

2.1 Objectives

The objectives are to establish coastal resource management by the village community, develop offshore fishing grounds, develop fisheries infrastructure, reduce post-harvest losses, create a fishermen association that reflects local conditions, and other measures in order to develop small-scale fisheries and establish a stable fish supply in the district, in the tandem with the development objectives set in the master plan, The Study on Fisheries Infrastructure Support and Coastal Communities Development Plan in Eastern Indonesia. The lessons that are learned from the development project and the model projects that are implemented in this study will be applied in other regional fisheries development plans in the NTB and NTT provinces where the local fishing communities will be divided into focal centers.

2.2 Basic Development Concept

The predominant fishing methods in this zone are Bagan (lift net fishing) and purse seines that are carried out in Waworada Bay. The mesh size of the nets used in both types of fishing is small and greatly impacts the fishery resources in the bay. Therefore, they should be controlled in future to achieve sustainable fishery resources in the bay. To achieve this, the unexploited fishery resources outside the bay must be developed to raise fisher incomes or the present level of economic losses sustained by the fisheries industry must be reduced (long hours spent landing the fish, lowered fish quality due to shortage of ice, inferior processing technology and the lack of competitive viability of processed fishery products). In addition, district laws and regulations to promote coastal fisheries and district government measures to improve the fisheries system are needed. However, due to the lack of fishing knowledge, shortage of capital, lack of organizational skills, facilities, institutions, and equipment to support fishing activities, the fishermen have been forced to survive under the inferior conditions that prevail in production, marketing, and the living environment.

The Waworada Bay coastal fishing villages will play a central role in fish marketing activities. The following measures will be implemented to comprehensively improve all of the prevailing conditions explained above.

- 1) Due to the nonexistence of fishing rights for the local fishermen and in order to help fishermen achieve an adequate level of resource management, an initial coastal resource management system that can be implemented by the fishermen and the local government will be implemented, in conjunction with measures to improve the knowledge of fishermen about coastal resources management and to improve the local government's fisheries system.
- 2) Develop the facilities related to the fishing activities of the fishing villages within the bay such as fish landing, shipping, marketing, and processing. Conduct technical training for fishermen and fishing village women and extension activities to improve fisher income.
- 3) Based on a performance review of past fishing village cooperative activities, a new fishermen association will be created that will produce benefits for the fishermen. The local government and other local organizations will assist this organization until it has developed sufficiently to operate independently.
- 4) As in the case of the Bima priority zone, a programme to strengthen the self-motivation of the fishermen to improve their living environment and village infrastructure will be developed.

- 5) A training and extension programme to disseminate the activities described above to other districts and sub-districts will be developed.

2.3 Sector Plan

2.3.1 Plan for Coastal Resources Management

According to the statistics of the district fisheries office, the annual fish catch volume of Waworada district was 7,243 tons in 2001. However, the annual volume was estimated at 5,223 tons under this study in view of the fact that nearly half of the purse seiners move to other fishing grounds (in Sape and Sumbawa) from January to March yearly (see Appendix 1). The total allowable catch (TAC) in the bay is estimated at a mere 756 tons annually by the NTB Provincial Fisheries Office. This is because the data on resource volume according to each water body throughout the nation that was estimated by the Central Fisheries Research Center was proportionally allocated according to a 12-mile water area. In reality, the majority of the demersal and small pelagic fish concentrate in shallow waters of less than 200m. Therefore, the above estimate is not an accurate statistic. In studying the characteristics of each water area, if the resource volume allocated for Bima district (25,808 tons) is redistributed according to water area, the resource volume of Waworada Bay is estimated at about 6,500 tons (see table below).

Water Area	Estimate of Provincial DOF	Estimate of Study Team	Basis for Estimate
Flores Sea	11,281 tons	3,760 tons	The estimate of the study team is about one-third of the estimated value by the District Fisheries Office because fishing boats set sail from about four miles from the coast in the shallow water areas of less than 200m in Sumba Strait, Flores Sea, and the Indian Ocean.
Indian Ocean	5,186 tons	1,729 tons (unexploited)	
Sumba Strait	3,479 tons	1,160 tons (unexploited)	
Bima Bay	276 tons	706 tons	Based on its geographic location, the study team's estimated value (3,760 tons) was subtracted from the resource volume for the Flores Sea (11,282 tons). This amount was distributed between Bima Bay and Sape Strait based on the ratio of water area.
Sape Strait	4,830 tons	11,944 tons	Based on its geographic location, two-thirds of the resource volume for the Indian Ocean and Sumba Strait was added to the resource volume for Waworada Bay.
Waworada Bay	756 tons	6,532 tons	
Bima District Total	25,808 tons	25,808 tons	

Based on the review shown above, it was concluded that the fishery resources for Waworada Bay are presently within the scope of the TAC, since the size of the fish landed was comparatively larger than the fish harvested in other districts. However, it is estimated that the fish catch volume has presently reached 80 percent of the TAC; therefore, a resources management system for the bay interior should be quickly established. Moreover, the unexploited resource volume in the coastal waters outside the bay is estimated at about 3,000 tons. Therefore, measures to develop and utilize the resources outside the Waworada Bay should be pursued in conjunction with measures to achieve sustainable use of the resources within the bay.

A. Project to Improve the Data Collection System

Presently, there are two data collectors temporarily hired by the District Fisheries Office for Waworada. Data is collected once a month, and it is based on a sampling survey of the fish catch according to fish species at the landing site. The fish landing volume is calculated by multiplying the number of registered fishing boats and the fixed number of

fishing days per month. However, the data is not accurate due to the seasonal fluctuations in the fishing operations of the fishing boats, the lack of data on daily fish catch volume, and the lack of accurate fish landing data for the bay. There are also budgetary constraints that impede the efforts of the District Fisheries Office to collect data, and presently, it is difficult to increase the frequency or the content of the data collection task. None of the fishermen maintain a daily record of their fish landing volume or sales transactions, and the groundwork for sound fisheries management practices does not exist.

In view of these circumstances, it is essential to establish and implement an accurate and effective data collection system despite limited human resources and a restricted budget. A specific approach is to have the fishermen keep a daily record of their fishing operations. This data will be incorporated as part of the statistics and the daily recordkeeping task will heighten the awareness of fisheries households about management practices. However, in order to promote this activity, preferential treatment in credit activities should be established to increase the fishermen's incentive to maintain daily records. For example, a trial recordkeeping task was implemented where 16 Rompo fishermen were asked to maintain a record of their fishing operations for a one-month period in February 2002. All the fishermen, including fishermen of manually operated boats, successfully completed the task despite the individual differences in the content of the records. Therefore, although there is a need to slightly revise the format of the records according to fishing method, it was concluded that the fishermen were fully capable of keeping their own fishing records. Some of the 16 fishermen (or their family member) who participated in this trial, kept a separate record. Fishermen who are unable to write have family members or relatives write in the data. Furthermore, as this practice becomes established, each fisheries household will begin to be aware of the importance of education, and it is anticipated that this will contribute to a decrease in the dropout rate of primary school children.

A specific project plan to improve the data collection system is shown below.

(1) Scope of the project (targeted area)

Targeted villages: 3 administrative districts (Waworada, Karumbu, Karanpi)

Targeted fishermen households: 782 households

Targeted number of fishing boats: About 150 boats (40 Bagan boats, 44 purse seiners, 14 gill net and bottom long line boats, 50 hand line boats)

(2) Content of the Activity

	Content of the Activity	Person-in Charge	Period
1	Improve the format of the records (based on the findings of this study survey, the format will be revised).	1 Fisheries officer 2 Data collectors	5 days
2	Distribute the format of the records and explain the recording method (fishermen will be gathered at each village and a workshop will be held. After an overall explanation has been given, the fishing operation of each individual will be confirmed, and the recording method will be explained accordingly).	1 fisheries officer 2 Data collectors	5 days (15 boats/day)
3	One-month trial recordkeeping task (making the rounds of the participating villages, monitor the progress of the recordkeeping activity, provide individual guidance as needed).	2 Data collectors	10 days
4	Collect the formatted records and check the content (hold a social gathering at each village, check the records of each fisher, and answer questions, provide guidance).	1 Fisheries officer 2 Data collectors	5 days (15 boats/day)
5	Evaluate content of the records, analyze data (fisheries officer will supervise the analysis method and procedure to the data collectors).	Same as above	30 days

6	Compile and distribute the logbook (the logbook will be a loose-leaf notebook, in addition to the data sheet, fishing license, training and seminar participation record, record of data submitted, and other additions will be included. Ballpoint pens and calculators will be distributed together with the logbook).	Same as above	To be compiled in 30 days To be disseminated in 5 days
7	Data collection and analysis (fishermen will submit their logbooks to the data collectors once a month which will be confirmed and stamped. The data will be inputted into a personal computer and sent to the District Fisheries Office once a month).	2 Data collectors	15 days/month (12 month period)
8	Guidance on improving fishing operations of fisher households (based on the data that is analyzed, a study group for fishermen will be held once every three months and advice and guidance will be given to help resolve the problems faced by fishermen).	2 Fisheries officers	5 days/time (4 times/year)

B. Project to Expand Fishing Licensing System

A licensing system for fishing boats exists in Bima district where a registered list is compiled, licenses are issued, and licensing fees according to fishing method and scope are collected. The data on fishing boats is based on the findings that are obtained from a survey on fishing boat count that is conducted once every five years. However, fishing boats are built yearly and the number of fishing boats and their movements fluctuate according to season. In addition, due to the difficulty of visiting the fishing villages that are dispersed throughout the region, an adequate survey cannot be conducted. Despite the existence of a boat registration system, since the registration number and port of registry are not on the boat, it is difficult to find and check unregistered boats. Although manually operated boats can be excluded, a plate or other markings on the body of motorized boats are needed. A list of motorized fishing boats was compiled during this study, but it was carried out in conjunction with the field survey at the landing site for one month and data on all the fishing boats could not be collected.

Based on the conditions described above, the following activities will be implemented to expand the existing system of fishing licenses.

	Activity	Person-in-Charge	Period
1	Renew the existing list of fishing boats (a survey count and confirmation based on the existing list will be conducted in the field survey. Based on the findings that are obtained, the existing database will be revised.)	2 data collectors	60 days
2	Issue licenses and collect licensing fees (in accordance with the existing system, licenses will be renewed for the expirees that are found during the survey explained above).	1 fisheries officer	15 days
3	Formulate a licensing system for boat construction (formulate and implement a licensing system for newly built boats. Notify the fishing villages of the new system and hold public hearings.)	1 fisheries officer 1 District officer	30 days preparation, 30 days licensing period, 5 days for public hearing
4	Boat markings (based on the list of renewed licenses, markings for the fishing boats will be prepared and distributed to each registered boat. The markings will indicate the boat's port of registry and fishing method. For fishing boats from other districts that operate in Waworada Bay, seasonal licenses will be issued.)	1 fisheries officer 2 data collectors	15 days (10 boats/day)

C. Project to Expand Fishing Grounds

As explained earlier, much of the coastal fisheries in Rompo are conducted in the bay, and fishing grounds outside the bay remain unexploited. Although fishery resources in the bay have not been depleted, the TAC has surpassed 80 percent. If the fishing effort in the bay continues to grow, it will adversely affect its fishery resources. To shift the fishing boats to

offshore operations in future, it is important to develop fishing grounds outside the bay and to disseminate information about these resources to the fishermen.

According to the comparative five-day survey findings on the fish catch of fishermen operating within and outside the bay, the fish catch volume and sales profit of purse seiners operating outside the bay were higher than fishing boats operating inside the bay (see Appendix 2). Hence, there is the potential to develop outside fishing grounds for purse seiners in future. In contrast, the fish catch volume for bottom fishing in the bay was higher than the fish catch harvested outside the bay. However, this was the first time bottom fishing was tried in the outer fishing grounds and this may have been an adverse factor. In future, it is important to develop and create fishing grounds outside the bay by implementing continuous trial fishing operations to exploit demersal fish resources. The harvest ratio of large pelagic fish such as tuna and bonito will grow in conjunction with the development of the outer fishing grounds. Therefore, there is ample potential to develop and disseminate trolling by setting fish aggregating devices (FAD) to effectively raise the fish catch.

C-1 Developing Offshore Fishing Grounds

The FAD that is presently commonly used in the eastern Flores region is not utilized in Waworada. Fishermen rely on visual observation in daytime fishing operations using purse seines, but it is anticipated that relying on visual observation to find schools of fish outside the bay will be a time-consuming task. Therefore, to raise the fishing efficiency outside the bay, FAD will be used on a trial basis. The aim of the FAD is not to increase the fish catch, but to diversify the fishing effort that is concentrated in the bay to the water area outside the bay. It will be used as one means of aiding water management practices. In addition, it will also be used at the coastal fishing ground surveillance station that will be explained later. The location where the FAD will be set, the size, and number will follow the standards used in the project to develop a surveillance system for coastal fishing grounds.

The FAD is used to harvest pelagic fish; therefore, it is not suited to disseminating the use of bottom fishing and bottom long lines. For bottom fishing grounds, a scientific survey using a fish finder will be conducted to find fishing points outside the bay utilizing the fishing boat and high-speed small boat that will be provided for the model site. The Bima district Fisheries Office has built a trial artificial reef (a simple concrete block) at a depth of 60m in Sape and Sanigan. Based on the results that are achieved from this trial operation, a simple FAD that fishermen will be able to construct will be developed and fishing grounds for bottom fishing will be created in a specific water area.

C-2. Large and Modernized Fishing Boats

The fishing boat that is commonly used in this district is a small fishing vessel that is 8 to 12m long. It is manually operated and has space to carry an insulated fish hold. Due to the high waves outside the bay, fishing boats are unable to safely carry out fishing operations continuously for several days outside the bay. Hence, only one-day fishing operations can be conducted, and fishing areas are inevitably limited. Unless measures are taken to introduce large and modernized fishing boats, the success of measures to develop offshore fishing grounds outside the bay will be limited.

In view of these circumstances, one fishing boat (hereinafter referred to as the model fishing boat) will be provided under this project for the model area to conduct trial fishing operations (of about three days) and training for fishermen (especially young fishermen) as part of the effort to develop fishing grounds outside the bay. The fishing boat will be a vessel

capable of conducting a variety of fishing operations (purse seines, gill nets, angling, trolling, and others). Fishing groups will use the boat on a rotational basis.

The model fishing boat will be durable and navigationally capable for use in trial fishing operations in the bay and in the offshore waters outside the bay. It will accommodate a crew of ten people and will anchor in safe coastal waters to conduct fishing operations of one to three days. Purse seine will be the major fishing method, but other methods such as gill nets, angling, and trawl nets will also be used. A summary of the basic fishing functions and specifications of the model fishing boat is shown below.

[Basic Fishing Functions]

Fishing equipment: Hydraulic roller (wiping drum) used with purse seines

Fish lamp: Kerosene lamps and electric lamps, purse seines, and equipment related to angling, etc.

Fish hold: Insulated fish hold will be installed to keep the fish catch in ice

Auxiliary navigational and fishing instruments: Small GPS, magnetic compass, small fish finder, portable VHF wireless transmitter, radio, etc.

[Summary of the Boat Specifications]

Type of boat: FRP single decked boat

Dimension of boat: L=approx. 13m, B=approx. 3.7m, D=approx. 1.4m

Main boat engine: 90HP diesel engine

Number of crew: About 10 people

Fish hold: Insulated fish hold approx. 7m³

Fishing equipment: Hydraulic roller (warping drums), davit for purse line blocks, fish aggregating lamp

Navigational instruments: Small GPS, magnetic compass, small fish finder, portable VHF transceiver, radio, etc.

Fishing equipment: Purse seine (approximate length 400m x approximate depth of 60m), gill nets

Crew's space: A room will be provided for crew under the deck so that they can take a rest in turn. An area, which shelter crew from rain, wave splash and hard sunlight, will be also provided on the deck, where it will not interfere with fishing operation.

Since a long-term system of financing is not available for fishermen in Indonesia, it is difficult for the majority of the small-scale fishermen in the study area to shift to large fishing boats. In order to promote the widespread ownership and use of the model fishing boat among the coastal fishermen, it is vital that a long-term system of finances for fishermen is established in future.¹

C-3. Motorized Fishing Boats

The motorization rate of fishing boats in Waworada Bay is 83 percent and high. In addition, although government and cooperatives provide small credit activities, credit to

¹ The work shifts of fishermen are divided and the voluntary shifts that are established by the fishermen in the region are very important and should continue to be respected. The use of fishing lamps is recommended in areas outside the bay where lift net fishing is not conducted. But emphasis will be given on regulations on water areas outside the bay that do not compete with lift net fishing to support the prevailing self-voluntary restrictions. The general consensus of the local fishermen will be a preliminary condition that must be met before regulations are established.

promote the motorization of fishing boats to diversify fishing grounds is not available. Therefore, the existing system of revolving funds will be used to promote the spread of motorized fishing boats.

D. Project to Improve the Surveillance System of Coastal Fishing Grounds

Although the number of fishing boats from other regions that operate in Waworada Bay is minimal, blast fishing has been occasionally observed in the southern coastal area of the bay and outside the bay (southern coast of the peninsula). The identity of the boats engaged in this illegal form of fishing is unknown. If a system of distributing port registry markers with boat identification numbers is implemented, it will be easier to distinguish fishing boats from other districts. This practice will strengthen the system of reporting and controlling boats engaged in illegal fishing.

D-1 Develop an Ocean Wireless Communications Network

Although fishermen have observed boats engaged in illegal forms of fishing such as blast fishing, they are reported to the Fisheries Office and relevant government bodies much later after they return to port. Therefore, an ocean wireless communications network will be established to enable fishermen to immediately report any illegal fishing vessels that are observed during their fishing operations.

For the land office: VHF wireless table unit (25W), 1 unit (based in Rompo)

For use in the bay: VHF wireless portable unit (5W), 2 units (1 unit for use in the eastern area of the bay and 1 unit for use in the western area of the bay)

For use in the water area outside the bay: VHF wireless portable unit (25W), 3 units (in areas where the FAD will be set up)

D-2 Fishing Ground Surveillance around the FAD Base

A surveillance system implemented in cooperation with the local fishermen is feasible since the entire water area in the bay can be visually observed by local fishermen who fish in the bay daily. For fishing grounds located outside the bay, the center of surveillance activities will be the FAD site that will be part of the effort to diversify the fishing grounds. The site of the FAD, their size and number will be as follows.

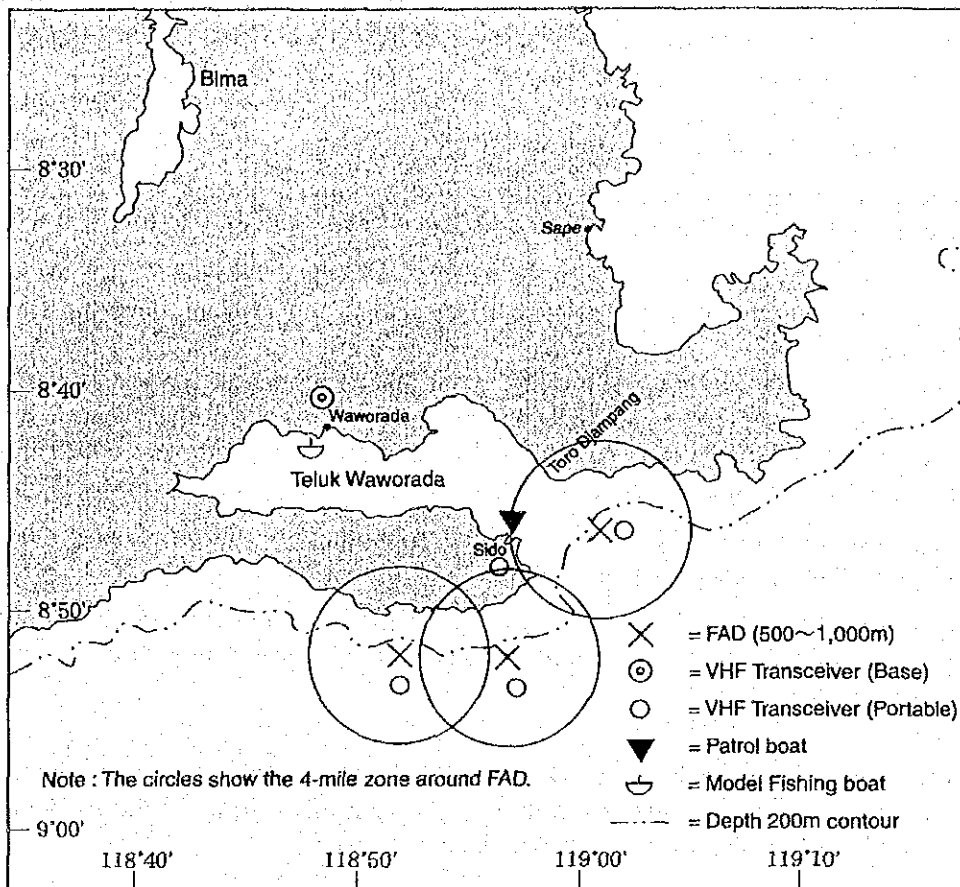
Installation condition:

- 1) Will be installed in trawler and purse seine fishing grounds outside the bay for the use of motorized fishing boats
- 2) Will be installed within the four-mile water area managed by the district on the outer edge of the island
- 3) Set up a VHF wireless communications network (extending from the land base to within a radius of 20 miles)
- 4) Ocean floor bottom is relatively flat. Areas with constant high waves will be avoided.
- 5) The water depth will be set at less than 1000m in order to reduce the cost of the anchoring rope.

Fishing method: Purse seines (existing), others, trolling, stationary gill nets (will be explained in the section on spreading the model fishing boat)

Number of FADs: 3 (at a water depth of 200m to 500m)

Installation site: 1 FAD at the east side of Waworada Bay, 2 FAD at the southern region of the peninsula outside the bay (see the following figure)



Existing Fishing Grounds and FAD Locations

However, the specifications, number and economic benefits must be reviewed based on a survey of the ocean conditions and topography of the seabed of the proposed installation site, in order to prevent the FAD from being carried away by rough waves and to curtail the cost of unneeded anchoring rope.

D-3 Controlling the Dispatch of Fishing Boats in Emergencies

If a fishing boat that is engaged in illegal fishing operations is observed in the surveillance area, the information will be quickly relayed to the land base via the wireless communications network and the Fisheries Office will promptly send out one vessel to quickly control the situation. In addition to controlling illegal fishing operations, a vessel will be dispatched in the event of a marine accident or other emergencies. About 100 emergency dispatches are estimated in one year.

Size and Specifications of the High-speed Boat

- An FRP boat with a total length of 7 to 8 meters that can be raised on to the beach, with an 80HP engine
- Navigational speed of more than 20 knots, capable of holding a crew of more than five people, able to navigate the coastal waters within 4 miles
- VHF wireless communications, GPS, fish finder

D-4 Model Activity to Draft Coastal Fishery Rules by the Local Community

Decisions on how the fishery resources in the bay are utilized have a direct bearing on the lives of the fishing communities located in the bay. In recent years, model projects have been started in each region under the policies of the central and local governments to promote aquaculture as an important means of developing fisheries. The inner waters of the bay are very suited for aquaculture due to the relatively quiet waves, but rules must be drafted to regulate the use of this water area with existing fishery activities.

Moreover, the coastal areas within the bay are the nursing grounds for a variety of marine fish fry since there are mangrove forests, seaweed beds, and coral reefs that should be stringently protected.

The ocean has been designated as a public asset and all citizens have the right to access its resources. Subsequently, the exploitation of marine resources has been emphasized and conservation measures have tended to be a secondary concern. Thus these rearing grounds are vulnerable and may be easily destroyed. In order to control the situation and to develop the use of sustainable resources, the local community must carefully draft rules on the use of resources for each specific area.

Although some regions in Indonesia continue to maintain traditional rules on the use of coastal resources, there are very few areas where such rules clearly exist in the study area.

Thus the model project will be implemented in a fishing village within the bay where there is a great need for fisheries and aquaculture to coexist in future. This will be designated as the *model area*.

(a) Objective

The objective of this project is to raise the local community's awareness about the need to effectively use the bay's resources through the task of drafting model rules on the adequate management of coastal resources by the local residents.

(b) Content of the plan

The local coastal residents and a consultant/NGO without vested interests will work jointly to draft rules on the use of coastal resources. The district fisheries officer will participate as an observer and the task of drafting the rules will be conducted in the following two stages.

Stage 1

The consultant/NGO will be responsible for the following.

- Have an understanding the traditional use of coastal resources in the region.
- Define the potential use of resources in the region and clarify the prevailing conditions (including an overall understanding of the coastal plant life, topographic characteristics of the bay, and hydraulic characteristics)
- Pinpoint parties with vested interests that are using the fishery resources in the area.

Stage 2

The consultant/NGO and the coastal residents will jointly carry out the following tasks.

- Hold discussions between the residents and parties with vested interests on the need for resource management measures.
- Hold discussions between the residents and parties with vested interests about problems related to resource development and pinpoint the need for resource management criteria.

- Pinpoint and compile the use of receptive and unreceptive resources and their utilization methods. Draft resource management rules by the community and rules on the use of open areas in the bay based on this compilation.
- Hold discussions between the community residents and parties with vested interests on the written rules to promote their active participation in observing the mandatory rules and to achieve a consensus.
- Formulate the operations of a resource management committee according to community and a bay resources management committee and conduct an election of the committee leaders.
- Consultant/NGO will support the activities of these committees to raise funds.
- Review the use of the resources of the surrounding area according to community.

(c) **Implementation Method**

The rules will be drafted by the local residents residing inside the bay, parties with a vested interest on the use of resources inside the bay, and the facilitator. The facilitator that will be selected will have a wide knowledge about fisheries, will be able to balance the rules drawn up by the local community with the existing district fisheries regulations, will have an understanding of the vested interests and actual conditions that prevail in the region's fisheries industry. The district fisheries officer will participate as an observer.

The tasks of the consultant/NGO in stage 1 will be carried out within a ten-month period and the assistance of a technical expert will be solicited in understanding the natural characteristics of the area. The tasks will be carried out within a six-month period in stage 2. During this period, a workshop according to the communities in the bay will be held three times.

(d) **Methods to Reflect the Benefits that Are Derived**

Based on the rules that are drafted, the community and District Fisheries Office will discuss and draft a plan on the effective use of the surrounding area's resources owned by each community. This utilization plan will include development in stages and monitoring activities. A reasonable system of resident cooperation and a means of distributing profits will also be included. The District Fisheries Office will introduce access to capital that is needed to implement the plan and provide technical guidance.

2.3.2 Plan for Fish Landing, Handling, Marketing and Processing

(1) **Number of Targeted Fishing Boats and Handling Volume**

The objective of this project is to provide a stable supply of popularly consumed species of fresh fish to the district market through improved fish landing, handling, and shipping methods and to reduce the economic loss stemming from unsold fresh fish. Therefore, during stage 1 the focus will be to improve the quality of the present scope of landed fish. In future, increased fish landing volume can be anticipated as a secondary benefit generated by the project. But this benefit can only be expected during stage 2 after problems related to quality have been resolved.

1) **Number of fishing boats and fishing landing volume**

The fishing boats targeted in this project will be limited to motorized boats. Manually operated boats that have a small fish catch volume will not be targeted in this project, but if the project is operated efficiently they will also be included. The average number of fishing boats in port per day (peak hours) during the peak fishing season (May to July) and the fish landing volume have been estimated and are shown in the table below.

Type of fishing boats	Fish landing		Average number of vessels in port		Average fish landing volume	
	Time Period	Hours	Boat/day	Boat/hours	Tons/day	Tons/hours
Lift net	06:00-09:00	3	1.8	0.6	0.12	0.04
Purse seiners	17:00-20:00	3	38.7	12.9	12.91	4.30
Gill net, bottom long line	Unknown	6	10.1	1.7	0.30	0.05
Fish collection vessel	02:00-07:00	5	21.3	4.3	8.57	1.71
Total	-	10	71.9	7.2	21.90	4.30
Peak total hours	17:00-20:00	3	38.7	12.9	12.90	2.19

Appendix 1: See Tables 1-10.

2) Breakdown of the fish catches according to use

A breakdown of the fish landing volume in each area according to use, based on the fishing methods given in Appendix 1, is shown in the table below.

	Present Conditions			Targeted Improvements		
	Fresh fish	Unsold fresh fish	Processed fish	Fresh fish	Processed (existing products)	Processed (new product)
Volume used (tons)	2,265	494	2,088	2,573	1,981	293
Ratio (%)	47%	10%	43%	53%	41%	6%

Appendix 1 See Tables 1-11.

Presently, 57 percent of the fish catch volume is marketed as fresh fish, but about 10 percent of the fish catch volume remains unsold as the period from March to December is the fishing season for Bagan fishing vessels and purse seiners. Unsold fresh fish can be sold the next day if it is packed in ice. But the fishing method and fishing period of the fish landing sites in the district that supply Bima market are nearly identical, and the consumer city markets that are west of Bima (Dompu, Sumbawa Besar, Mataram, Denpasar) are also overflowing with fresh fish during this period. Therefore, the unsold fresh fish (low cost sardines, round scads, frigate tuna) in this zone will be produced as new processed products to be sold in markets outside the district. The quality of existing processed products will be improved to increase the retail price.

As a countermeasure against the daily fluctuations in the fish landing volume, fresh fish will be packed in ice and production adjustments will be made by fishing boats as much as possible in order to achieve stable shipments of fish and fish price. Although the purse seiners in the district are not affected during the full moon and since it is the sole fishing operation conducted during day, it is possible to control the fluctuations in the shipping volume by concentrating on fishing operations before and after the full moon when Bagan fishing is not carried out.

(2) Review of the Project Components

A. Fish Landing and Fish Handling Improvement Project

As explained earlier, fish landed at other fishing villages in the bay by other fishing boats are also shipped to Rompo. About 30 small fish collection boats (12m in length, 12-person capacity) travel to and fro between the nine coastal fishing villages per day and are a focal means of ocean transport in the bay. In Rompo, the fish catch of these collection boats are landed at the beach in front of the village, but there is a large three meter disparity in the shoals during the high and low tides, and subsequently the beach is exposed up to 150m during ebb tide. As a result, the fishing and collection boats stop at a distance of about 200m

from the coastline where there is sufficient water depth during the ebb tide. The fish catch is then brought in by sampans to a distance of 150m to the shore where it is then manually carried to the shore in plastic containers (20 to 30kg capacity) through the mud and sand. This is a very arduous and extremely time-consuming task. Moreover, this task is carried out at dawn and just before sunset, and laborers must carry lamps while carrying the fish through the mud, making this a difficult and dangerous task. During the ebb tide, the cargo boats utilize the rock embankment built by the Japanese army (which is submerged during high tide) to land their cargo, but due to the poor footing, there is the constant danger of accidents and it is exceedingly dangerous.

In contrast, the project site is located about 200m from the coastline in a shoal where the water depth abruptly drops beyond that point. Since it is located in a small area inside the bay, it is unaffected by rough waves throughout the year. Additionally, the existing rock embankment can be effectively repaired and used as a fish landing facility at relatively low cost.

Currently, the fish is taken to the existing sorting area (TPI about 25m²) after it is landed and utilizing the roofed areas of each fisheries household, it is sold to the retailers and fish traders gathered there. In order to purchase the fish as quickly as possible, many of the retailers and traders do not walk the dry beach, and the task of landing the fish is carried out by the fishing boats. However, in Sape, the retailers and traders wait near the end of the jetty where the fishing boats moor and begin sales transactions out in the open sun, despite the nearby fish landing facility. Although the task of supervising the retailers and traders to wait at the facility until the fish has been brought to the handling area is not a difficult task, it will take time to establish such a practice in view of the prevailing conditions at similar facilities. Therefore, the handling area for the fish catch will be built behind the jetty where the fish is landed. If the mooring site is distant from the handling/auction area, there is the strong possibility that it will not be utilized. As a result, the fish catch will not be handled in a sanitary environment. This is an important factor to consider in designing the facility.

Based on the explanation above, the fish landing jetty will be located about 200m from the coast and a fish handling and auction hall will be constructed behind it.

(a) Land facility

As explained above, a jetty will be constructed to enable fishing boats to directly moor at the jetty and land their fish catch. After the boats have been moored, the fish catch will be carried to the sorting area behind the jetty in plastic containers. After the fish has been sold, the fishermen will wash the plastic containers and store them in a designated storage area. The fishermen will be able to refuel and restock their boats for their fishing operations the next day between the sales transactions after their catch has been landed and before they move their boats away from the jetty. The mooring time allocated for one fishing boat is estimated at 30 minutes and the calculations for the landing jetty and size of the plastic containers are as follows.²

(a-1) Jetty for the Land Facility

The length of time the landing facility will be used by each boat will be calculated according to the number of fishing boats landing their fish catch during peak hours. A permanent berth will be made for the model fishing boat (15GT) for fish landing, preparation and layover. In addition, a designated landing facility for passengers embarking and

² In order to facilitate the fish landing process, jointly owned plastic fish boxes (60 liter capacity, mesh) will be provided by the project. Collection boats will use the plastic containers that they presently own (round, 30 liter capacity).

disembarking from the transport boat will be created for convenience and safety since the site will also be the base of operations for the ocean transport boat operating between the villages scattered within Waworada Bay.

Calculations of the length and water depth required for the fish landing jetty, the berthing facility for the model fishing boat, and the ocean transport boat facility are shown in the table below.

Length of the Mooring Jetty								
Type of fishing boat	Landing time	Average no. of boats in port (boat/day)	Average mooring time (min)	Average boat length (m)	Berth length (m)	Number of berths	Required length (m)	Required water depth (m)
Purse seines	3	38.7	30	12	13.8	7	100	-2
Model fishing boat	-	1	-	16	18.4	1	20	-3
Transport boat	12	32	60	12	13.8	3	42	-2

Note: Required berth length for one boat: Average boat length x 1.15m

Number of required berths: Number of fishing boats landing their fish per day ÷ (landing time ÷ landing time per boat) Appendix 4: See 4-1-2. Mooring Facilities

Based on the above, the fish landing and preparation berth for fishing boats will be a 2m fish landing site (L=100m); the berth for the model fishing boat will be a 3m jetty (L=20m); the mooring jetty for the transport boat will be a 2m landing site (L=40m).

(a-2) Plastic Containers

During the peak landing times, the average fish landing volume for 30 minutes is 2,152kg ÷ 50kg/boxes=43 units

(b) Fish Handling/Auction Hall

After the fish has been brought to the fish handling/auction hall and washed, they will be sold to the retailers and traders either through auction or direct negotiations depending on the number of buyers present on that day, the fish landing volume, fish species and other factors. This will be decided by the fishermen.

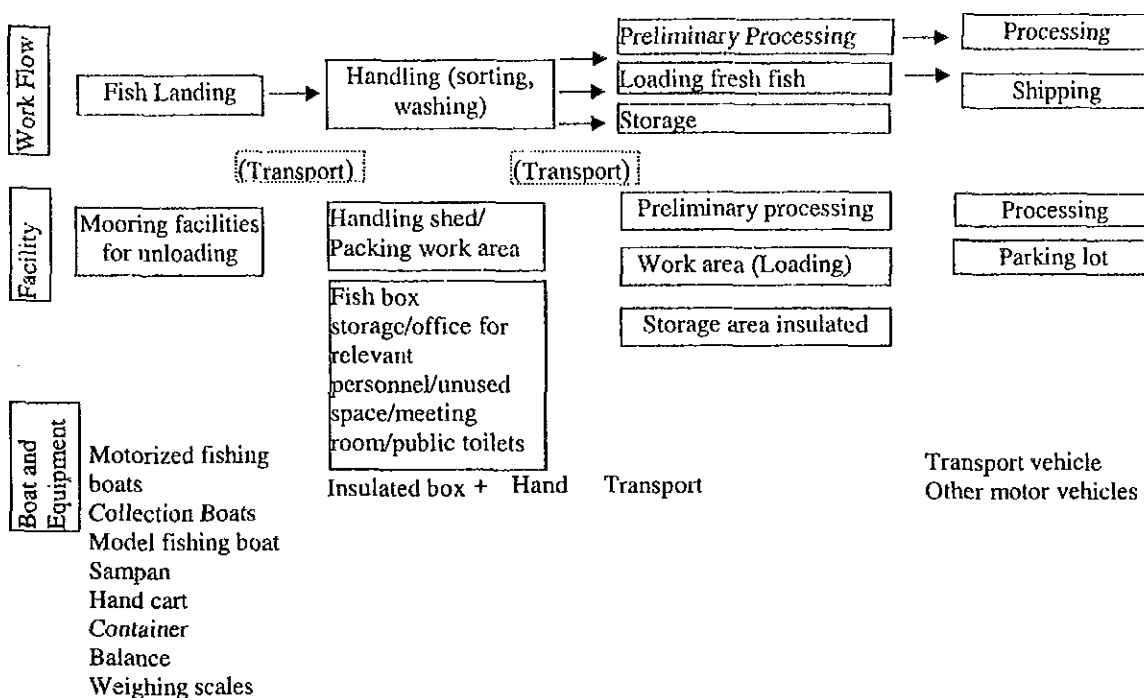
In the beginning, the fish will be sold according to the existing practice of container units or catch in number. But as the practice of transacting fish in kilogram units becomes widespread between the buyers and the sellers, a scale will be provided, the fish will be weighed, and sales transactions will be conducted according to weight.

The scales will also be used by the Fisheries Office data collector to check and record the average weight according to fish species and size in each container. This will also raise the accuracy of the data. Following the fish transactions, the fish will be transferred to the containers prepared by the retailers and traders, washed, packed in ice for shipment, or refrigerated for processing³.

The handling area will also be used in the preliminary preparations of dried and salted fish (scaling, gutting, filleting, and washing). The workspace area and equipment that will be needed is shown below.

³ Fresh fish that will be shipped will be packed in insulated boxes that were introduced and disseminated in the project to improve fresh fish shipping. The plastic containers that have been traditionally utilized in processing will be used.

(b-1) Sorting Area



Work Flow and Required Facilities

Based on the work flow diagram shown above, the fish handling/auction hall will be comprised of seven types of work areas as listed below. The space required for each work area according to the methods shown in Appendix 4 is as follows (see Table 4-1-3, Fish Handling/Auction Hall, and Appendix 4).

Scope and Content of Fish Handling/Auction Hall		
Facility	Work Content	Area of Space Required
Handling/auction hall	Fish sales and sorting of fish catch	240m ²
Secondary facilities	Machine room, office, auction room, etc.	80m ²
Temporary storage of insulated boxes	Insulated boxes for storage and shipment	30m ²
Packing area	Packing fish in ice	120m ²
Cool box storage space	Over night stocking space	40m ²
Loading area for shipment	Loading work using carts	120m ²
Preliminary processing area	Sorting, washing, processing of raw fish for processing	490m ²
Total		960m²

(b-2) Platform Scales

The average fish landing volume for every 30 minutes during the peak landing hours is 2,152kg ÷ 50kg/box ÷ 15 times/30 minutes = 3 units

B. Project to Improve Fresh Fish Transport

In the case of Bagan or lift net fishing, the fish collection vessel collects the fish catch at night out at sea (18:00 to 04:00) and sells it to traders and retailers at wholesale prices at dawn. In contrast, in the case of purse seiners, the boats return to port in the evening and fish catch is stocked in ice overnight and sold the following morning. There are about ten small

household freezers in this area and ice is sold in plastic bags. The estimated ice production volume is about 450kg per day (30 bags/table x 10 freezers x 1.5kg/bags), and it is extremely limited. Subsequently, the majority of the fish catch is not stocked in ice during the peak fishing season and it is transported to each district city market in the morning. In addition, an adequate volume of ice that is needed to stock the fish catch that is landed in the evening is not available. With the exclusion of three demersal fish collectors, the use of insulated boxes to store and ship fresh fish is not widely used in Rompo. Therefore, the project will help increase the production and sales of ice and spread the use of insulated boxes during the peak fishing season (May to July), when about 42 percent of the fish landing volume or 230 tons of fish per month is regularly transported during the ten-month period of March to December.

(a) Ice-making and Ice Storage

Based on the fish usage plan according to month shown in Table 1-11, Appendix 1, of the average daily fish landing volume of 21.9 tons (May to July), the volume of fresh fish that is transported is estimated at about 9.2 tons (42%) and 12.7 tons (58%) for processed fish. In addition, fresh fish shipment can be divided into two categories—fish that is sold on the day it is landed and fish landed in the evening that is stocked and sold the next morning. The volume of ice needed for three types of categories, including fish for processing has been calculated and is shown in the table below. Although fish can be transported at night, the volume of ice required for overnight stocking has been included in the estimates.

Category	Fish landing volume (ton/day)	Ratio of ice	Required volume of ice (ton/day)
Fresh fish	Sale on that day	25%	0.93
	Overnight stocking	75%	4.11
Processing	12.72	10%	1.27
Total	21.90		6.31

Note: Ice ratio according to category has been calculated based on fish freshness tests shown in Appendix 3-1.

According to the table shown above, the production capacity of the ice-making machine is 6 tons/day. The actual annual number of operating days was estimated at 270 days from the average ratio of the maximum fish landing volume according to month (annual average of 404 tons/month ÷ peak fishing season average of 547 tons/month x 365 days). In addition, since the maximum daily fluctuations in the fish landing volume were about twice the average value and ice storage capacity of 12 tons for two days was juxtaposed.

(b) Insulated boxes and creating a storage Area

Fresh fish will be stocked in ice in insulated boxes. The scope and number of insulated boxes will be reviewed according to the following two purposes.

- Fresh fish transport and sales by traders and retailers (calculated according to capacity and maximum number of people)
- Mandatory overnight storage of fresh fish (50 percent of the fresh fish volume landed in the evening)⁴

Based on the volume of fresh fish handled per day by traders and retailers during the peak fishing season and the volume of fresh fish stored overnight, the required number of

⁴ It is surmised that 50 percent of the fresh fish landed in the evening is stored in the insulated boxes of local traders and retailers.

insulated boxes was calculated as shown below (see Tables 1-5, Appendix 1).

Users	Volume of fresh fish stocked	Number of people	Number of insulated boxes according to size (storage capacity of fresh fish)			
			45L (30kg)	80L (50kg)	150L (100kg)	300L (150kg)
Traders	Under 50kg	31 people	31	-	-	-
Retailers	50-100kg	24 people	47	-	-	-
	100-200kg	13 people	-	27	-	-
	More than 200kg	14 people	-	-	28	-
Purse seiners	2,740kg	-	-	-	19	-

The fresh fish that is landed in the early morning is immediately transported to each city market. Therefore, a storage area for insulated boxes is required. In contrast, for fresh fish that is landed in the evening, each local trader, retailer, or fisher must stock the fish catch for shipment the next morning. Hence a storage space for insulated boxes will be created (300 liter capacity x 19 units). In the case of large-scale fish traders (who handle more than 200kg per day), the fish catch is immediately transported to the consumer markets since Rompo is a shipping point and there is no need to stock the fish.

(c) Fish Transport Vehicle

Although buses operate daily between Waworada and Bima, it is always crowded and in principle, the loading of fresh fish is refused. If space is available, the cost of transporting one fish box is about Rp.10,000 and expensive. Subsequently, the only other local means of fresh fish transport are three pickup trucks (cost of one-way trip is Rp.5,000/person, Rp.5,000/fish box). Although the traders and retailers from the surrounding areas of Bima (Tente, Sila, Ngali, Renda, etc.) arrive in buses, the majority packs and dry the purchased fish at the landing site and transport it. Hence the economic loss is great. One of the objectives of this project is to decrease the volume of unsold fresh fish by providing a stable supply of ice, but unless the means of transport for fresh fish is improved, the benefits that are derived from an increased ice supply may vanish.

Therefore, a fish transport vehicle that will deliver fish in the local and surrounding Bima area will be provided under this project. The fresh fish shipment volume per day during the peak fishing season is 9 tons. If the existing transport capacity of 3 tons and the local consumption volume of 1 ton are subtracted from the total tonnage, the transport volume is estimated at 5 tons. Since the fish is delivered to several destinations, two three-ton trucks will be provided.

(d) Communications Facility

A telephone and communications network is nonexistent in Waworada and the only means of communication in the district is at the Kantor Camat (district administrative office) where an SSB wireless unit has been installed. This has impeded the activities of the District Fisheries Office as well as aggravated emergency situations, and data on fish market conditions have been difficult to obtain. Presently, the District Fisheries Office is not equipped with a wireless unit. Therefore, one SSB wireless unit and one VHF wireless unit will be installed in Rompo under this project. In addition, one SSB wireless unit will also be installed at the District Fisheries Office in Bima. This wireless communications network will support and help the activities of the coastal resources management plan explained earlier to be effectively implemented.

C. Project to Disseminate Fresh Fish Handling Technology

It is doubtful whether the fish traders and retailers will utilize ice and insulated boxes to transport their fresh fish for the following reasons.

1. The destination is the district market that is located within a two-hour drive from the fish-landing site.
2. The fish are transported daily at dawn (04:00 to 06:00) when the temperatures are low.
3. The transport weight is greatly increased when fish is packed in ice.

Although the volume differs, ice is sold in plastic bags in Waworada and Bima at a cost of Rp.330/kg (Rp.500/1.5kg). To convince retailers and traders to utilize ice purchased at the fish landing site to transport fish that will be sold on the same day, the cost of the ice must produce merits that surpass transport costs and the extra work of stocking the fish in ice. The same is true for the use of the insulated boxes. To convince retailers who handle less than 100kg of fish per day to use insulated boxes, they must be convinced of the effectiveness of the insulated boxes, their easy transport, durability, and other merits.

To promote the use of insulated boxes, workshops for a maximum of 15 people will be held for fresh fish traders and retailers in Rompo.

(a) Guidance and manufacture of trial products

A reinforced polystyrene box will be manufactured on a trial basis, and traders and retailers will be given guidance on its use.

(b) Demonstrations on the effectiveness of maintaining fish freshness

Demonstrations on using ice to stock fish and its effectiveness in maintaining fish freshness for both the insulation box and the plastic fish box will be shown to the traders and retailers.

(c) Credit sales

The polystyrene boxes will be sold on credit to interested workshop participants. The wooden frames or tape reinforcement will be provided for free for those who purchase the boxes at this time.

(d) Rental and dissemination of insulated fish boxes

Insulated boxes will be rented at no cost for a one-week period to enable those retailers and traders who did not purchase the boxes to experience first-hand the product's effectiveness. Following this one-week free usage period, the product will be sold to those who want to continue using the boxes on credit (including the cost of the reinforcement). The boxes will be collected from those traders and retailers who do not purchase the boxes and a rental fee of Rp.100 (45 liter box) and Rp.150 (80 liter box) per day will be collected.

Insulated boxes are presently used by large-scale retailers and fish traders, therefore, they will not be included in the workshop described above, but they will be offered direct credit sales of highly durable and effective insulated boxes (FRP, 150 liter). During the first year, all of the insulated boxes will be sold at the manufactured cost (less than the retail price) and at very low credit interest rates. The workshops will target a total of 82 people with 15 participants per workshop. Six workshops will be held in one year.

D. Project to Improve Fish Processing

Presently fish is processed in the yard of each fisheries household. Due to the lack of a cutting table and clean water, the work is carried out in very poor sanitary conditions, where the stench and flies are rampant. The fish is cooked on the ground using firewood since there is no boiler, and there is the constant danger of widespread fire if there is a change in wind direction since the houses are built closely together.

The volume of raw fish that is processed averages about 10.5 tons per day during the peak fishing season (May to July). The aim of the project is to improve and disseminate the quality of existing processed fish products and to develop new processed products from the estimated 20 tons of unsold fresh fish (to be sold outside the district). The processing period will be for ten months excluding the peak wet season from January to February (see Tables 1-11, Appendix 1).

The processing plan for Rompo is explained below.

[Improving the Existing Processed Fish Product]

- *Improving the quality of salted and dried products (introduce small cooked and dried, seasoned fish)*

Based on the findings of the trial processing conducted in this study to reduce the oxidization that results from sun drying and to produce a higher quality product, the following guidance and extension measures on the processing method will be provided for the village women involved in the processing work (see Appendix 3, Trial Processing Findings). The aim is to install a boiler and drying table and to disseminate their use to other villages.

- Steam the fish before drying (less than 1 minute).
 - Flavor the fish before drying (marinate in Bumbu, etc.), the aim is to promote a variety of products.
 - Develop an improved drying table that economizes on space and raise the efficiency of the drying process.
- *Raise the efficiency and safety of salt broiling (Pindang Selepi)*
To improve the working environment, an iron pot will be provided and its use will be promoted.

[Develop and Market New Processed Products outside the Area]

Based on the findings of the trial processing project using local raw fish that was conducted in this study, the following new products will be developed and marketed (see Appendix 3, Trial Processing Findings).

- Processed half-dried bonito (vacuum packed)
- Processed fish balls (vacuum packed)
- Fillet, dried overnight (dried in the shade, vacuum packed)

An indoor processing room will be provided to carry out and develop these new products. The processing room will provide a sanitary environment where the tasks of washing, cutting, handling, grinding, pressing, seasoning, cooking, vacuum packing, product storage, and others are carried out. This model facility will be able to accommodate 10 to 15 women, and training, repeat trials, product review discussions, and demonstrations will be carried out at this facility. The women interested in marketing these products will form a group and will regularly visit Mataram and Denpasar to sell these products.

The model processing site will be included as part of the project facilities that will be provided to improve and develop the processed products explained above.

(a) The volume of fish to be processed

	Type of Processing	Fish Species	Ratio	Volume to be Processed
Existing product to be improved	Salt broiled	Bonito, frigate tuna, fusiliers, round scads, sardines, anchovies	25%	2.6 tons/day
	Salt dried/cooked and dried/soak and dry, dried sardines	Round scads, sardines, anchovies	75%	7.9 tons/day
New product development and promotion	Half-dried bonito	Bonito, frigate tuna, fusiliers	25%	0.5 tons/day
	Fish balls	Round scads, sardines, frigate tuna	40%	0.8 tons/day
	Overnight drying	Round scads, sardines	35%	0.7 tons/day

(b) Scope of the model processing facility

(b-1) Cutting, washing, processing facilities (for existing processed product)

In salt broiling, the processing is carried out at night and the fish that is landed by purse seiners in the evening is used. In contrast, fish that is landed in the morning mainly by Bagan fishing is used in the salt drying, cooked and dried, and the soak and drying processes. Therefore, the facility will be used for salt and broiling work at night, and salt dried, soak and dry, and cooked and dried processing during the day. As explained earlier, the cutting and cooking part of the process is done outdoors in the yard of a fisher household in unsanitary conditions, and there is also the danger of fire. Therefore, the entire process, with the exception of the drying process, will be carried out at the model processing facility. The content and scope of the facility have been estimated as follows.

(b-1-1) Iron pot

Salt broil: volume of 2.6 tons/day ÷ (30kg/one time/hours x 8 hours/day) = 10 units

Steaming: volume of 7.9 tons/day 1/3 ÷ (20kg/one time/minute x 20 times/hours x 3 hours/day) = 2 units

The salt broiling process is conducted at night and the steaming is carried out during the day. Therefore, 10 units will be produced.

(b-1-2) Preparation for processing

The work of cutting and washing the raw fish will be carried out in an unused area of the fish handling/auction hall. Therefore, an area specifically designated for processing will not be created.

(b-1-3) Drying area (drying rack)

Dry racks for demonstration purposes, 10 units of wooden racks (60cm x 400cm, 3 layers), and a wooden frame net panel (240 units) (120cm x 80cm) will be installed in the drying area. This area will also be utilized as an indoor storage area during the rain and at night.

(b-2) Indoor processing facility

This room will be used to carry out trial productions of new processed products such as fish balls, and dried bonito for a group of 10 to 15 women. A washing area, cutting table,

manually operated meat grinder, manual press, weighing scales, vacuum packager, freezer, and other equipment will be provided.

(c) How the model processing facility will be used

The facility will be used according to processing groups. The processing groups will be formed according to the following two methods.

(c-1) Groups created according to fishing boats

Much of the raw material that is used for processing will be supplied by the Bagan boats and purse seiners. Since the fish catch is distributed among the crew, the families of each crew (5 to 10 families) will comprise one processing group, i.e., processing groups will be created for each fishing boat.

(c-2) Groups made up of PKK (village association) units

The majority of the village residents are fishermen and their families. Therefore, the processing groups will be made up of PKK units (10 to 20 households per unit).

(d) Trial productions and workshops to disseminate fish processing technology

Trial productions of processed products and workshops will be held for the existing women groups, and the PKK groups and fishing boat groups that will be created as described above. One workshop will be held for three days (50 workshops/year) and the content of these workshops is as follows.

First day: Improvements to existing processed products (dried sardines, overnight drying, Bumbu marinated and dried, others)

Second day: Dried bonito processing

Third day: Fish ball processing, trial production and evaluation

About 50 percent of the revenue generated from the trial products, will be distributed to the workshop participants and the remainder will be used to sell the product on a trial basis in the local market by the fishermen association in charge of facility operations. Relatively good quality products will be vacuum packed and stored in refrigerated stockers and sold in Lombok and Bali islands on a consignment basis. The Fisheries Office and the facility operations group will be responsible for improving and disseminating the processing technology and developing marketing routes for the first year. After the second year, the operations of the model processing plant will be turned over to the most interested and active processing group and the plant's marketing activities will be gradually expanded.

E. Bima Fish Market

Bima town is the district's largest consumption center and it is a major destination of the fish harvested in Rompo. Presently, there are two markets in Bima—the morning market (Pasar Pagi) and the evening market (Pasar Sore). Approximately 100 to 150 people visit the Pasar Pagi daily and during the peak fishing season, an average of 200 fish traders and retailers sell fresh fish there. The average daily fresh fish sales volume is estimated at 7 to 14 tons (see Tables 1-5, Appendix 1).

The fish is delivered to the market during the early morning hours, and the fish from Rompo is brought in by truck and minibuses by fish traders. The Bima retailers sell fish at wholesale prices in the open lot next to the market. In contrast, retailers transport the fish

landed at Bima to the market by horse cart (Ben hur). The fish is sold in narrow aisles and the side roads running along the market since space in the market is limited. However, the majority of the retailers sell their fish on vinyl sheets laid out on the ground. The horse carts are parked nearby and the horses urinate. Moreover, the ground is unpaved, and when it rains, the area turns to mud. Retailers are forced to sell their fresh fish under terrible conditions. The environment of the empty lot that is used as the wholesale market and parking lot is not much better. Even if the fish landing facilities at Rompo are improved, it is difficult to provide the consumer with a hygienically safe and stable supply of fresh fish unless these inferior conditions at the Bima market are improved.

In view of these conditions, the fish retail area of the existing Bima market (Pasar Pagi) will be moved to a new facility in the adjacent lot to enable fresh fish to be sold in a reasonably sanitary environment. A parking area and wholesale retail area will also be created. This market will be located about 400m from Bima's existing fish landing site (Tanjung). It has been confirmed that this fish landing site will be renovated under the JBIC-SPL budget. In view of these circumstances, if the fish market is constructed between the Bima fish landing facility and the city market, which is also in line with the flow of customer movement, it will also have a highly beneficial impact on the operations of the Bima fish landing facility since it will enable customers to do all their shopping in one area, i.e., one stop shopping.

The scope of the renovations and improvements to the market are as follows.

- (a) Fresh fish retail market: Will accommodate 200 retailers, selling space per retailer is 1.5m x 1.5m
- (b) Fresh fish wholesale market: Space to conduct wholesale transactions for about 10 tons of fish for about two hours at dawn ($10 \text{ tons/day} \div (120 \text{ minutes/day} \div 20 \text{ minutes/transaction}) = 1.7 \text{ tons/transaction}$)

2.3.3 Plan for Fisheries Activities Support

A workshop, fueling and water supply facility, fish net repair area, fishing equipment retail area, and other fisheries support facilities will be provided. Consideration will be given to ensure that the operations of these facilities do not compete with the existing activities of private operators. Tenant space will be allocated to the existing operators as much as possible. However, activities that are presently conducted by the fisheries cooperatives will be continue to be conducted by the cooperatives.

(1) Workshop

The fishermen carry out simple boat maintenance and repairs such as filter and oil changes, but the existing repair shop handles the more difficult repair and maintenance work. The boat mechanic in the village is also a fisherman, and all repair and maintenance work for the community is conducted in his yard during his spare time. Moreover, spare parts must be purchased in Bima by each fisherman or ordered by the existing cooperative. In either case, time and cost is incurred.

A joint working area for boat engine repairs that can be utilized by both fishermen and the local mechanic will be provided by this project. In addition to engine repairs, the workshop will be used to build drying racks for fish processing and wood frame reinforced insulation boxes for fresh fish marketing activities.

(2) Fuel depot

Fuel is sold locally in the Waworada Bay, but they are scattered in each village.

Therefore, a land fuel depot will be built at the fish landing site in this project. Fishing boats will be able to refuel and replenish their water supply for their next fishing trip after landing their fish at the landing site. The refueling volume per day during the peak fishing season and the types of fuel that will be sold are shown in the table below.

Type of fishing boat	No. of boats in port/day	Average consumption volume/boat (L/boat/day)			Refueling volume/day		
		Diesel	Gasoline	Kerosene	Diesel	Gasoline	Kerosene
Bagan	1.8	40	0	0	72	0	0
Purse seiner	38.7	30	0	0	1,162	0	0
Gill net, angling	10.1	20	5	0	101	25	0
Collection boat	21.3	10	0	0	213	0	0
Total	71.9	100	5	0	1,548	25	0

Due to the large demand for fuel per day in this district, a fuel supply contract may be signed with the Pertamina fuel storage depot in Bima city that will ensure fuel is supplied regularly to Waworada (however, the retail price will include the transport cost). However, if a fuel depot that is directly operated by the planned facility is constructed, there is concern that it might adversely affect the operations of the existing private fuel retailers. Therefore, a fueling depot consisting of drum cans will be created and a tenant from the existing fuel retailers will be recruited. If none of the private fuel retailers are interested in operating this facility, the facility management body will be responsible for its operations.

Based on the assumption that fuel is supplied once every three days, one diesel tank (5KL) will be installed (1,548L/day x 3 days worth of fuel). Since the daily demand for gasoline and kerosene is low, they will be stored in drum cans (with hand pumps). If the fuel contract with Pertamina is not signed, an area to store and sell 24 drum cans of diesel oil (1,548L/day x 3 days ÷ 200L) will be provided.

(3) Water Depot

Household water is needed to ensure the sanitary handling of fish and fish quality. Due to the lack of a water depot in Rompo, water is not utilized during the entire process of landing, packing, and transporting the fish. Subsequently, the fish catch is handled under very unsanitary conditions and the drop in fish quality and freshness is notable. The fish is sold on the roadside in the sun at the Bima market under conditions similar to those in Waworada. Therefore, a water depot will be provided to improve fish quality and freshness and to ensure a minimum standard of sanitation during the fish handling process. The required volume of water and its usage is shown in the table below (see Table 4-1-6 Water Supply and Storage Facility, Appendix 4).

Water Usage and Types of Water				
Usage	Rompo	Bima city market	Type of water	Type of water used
(i) Wash fish	o	-	Fresh water, sea water	Sea water
(ii) Processing	o	-	Fresh water, sea water	Sea water, fresh water for processing facility
(iii) Drinking water for boat	o	-	Fresh water	Fresh water
(iv) Ice-making	o	-	Fresh water	Fresh water
(v) Cleaning	o	o	Fresh water, sea water	Sea water, fresh water at Bima market
(vi) Water for restrooms	o	o	Fresh water	Fresh water

Calculations on the volume of water used according to the method in Appendix 4: Table 4-1-6. The water that is used in fisheries activities differs according to the task; and the daily usage water supply pattern fluctuates greatly according to the time of day. Therefore, a water shortage may occur during the peak hours. To ensure that there is a constant supply of water, the water tank will have a storage capacity to contain water needed for one day.

Based on the above, the capacity and size of the water tank will be as follows.

Use	Water Supply According to Use			
	Rompo		Bima Market	
	Capacity	Type of Water	Capacity	Type of Water
Washing fish	6.6 m ³ /day	Sea water	-	-
Processing, preparation	5.1 m ³ /day	Sea water, fresh water for model processing facility	-	-
Water supply for boat	4.2 m ³ /day	Fresh water	-	-
Ice-making facility	7.2 m ³ /day	Fresh water	-	-
Washing (facility, equipment)	5.2 m ³ /day	Sea water	2.6m ³ /day	Fresh water
Sanitary use	4.0 m ³ /day	Fresh water	6.4m ³ /day	Fresh water
Volume of fresh water that is used	20.4 m ³ /day	-	9.0m ³ /day	-
Water tank capacity	20m ³	-	9m ³	-

(4) Fish net repair and outdoor storage

Since the sub-villages are densely packed along the coast, unused space for fisheries activities within the village is nonexistent. Hence, the work of repairing and temporarily storing fishing equipment (fishing nets) is done on board the fishing boat or is carried out in the cramped floor space of fishermen' homes. Thus much labor and time are required.

Therefore, a drying area for fishing equipment will be created where the work of washing, drying, and repairing fishing nets and other equipment can be carried out. In addition, a multipurpose storage area will be created to raise the efficiency of fishing activities. This multipurpose storage area will be used for the following.

- As added temporary space where cutting and processing can be carried out during fish landing hours
- As a temporary storage area for fishing equipment during preparations for the next fishing trip or during work breaks
- As storage space for cutting equipment and materials
- As storage space for fishing nets, ropes, fish boxes, and other equipment (see

The calculations for the outdoor storage area are given below (see Table 4-1-9, Appendix 4).

Fishing gear drying and storage area				
Land Use	Use	Required Area	Rompo	
			Number	Area
Fishing equipment drying area	Purse seine	330m ²	8	2,640 m ²
	Gill nets	75 m ²	2	150 m ²
	Sub-total	-	-	2,790 m ²
Open storage	Multi-purpose	10 m ²	-	270 m ²
Total	-	-	-	3,060 m ²

Note: Each fishermen household will use the open storage area for five days a month, which are non-fishing days.

(a) Drying area for fishing equipment

The drying area will be created for purse seines and gill nets.

Purse seines: Required number = number of purse seine operations $44 \times 5 \text{ days} \div 30 \text{ days} = 7.3 = \text{Approx. } 8$

Required area = $8 \times 330\text{m}^2 / \text{number of purse seiners} = 2,640\text{m}^2$

Gill nets: Required number = number of gill net operators $14 \times 3 \text{ days} \div 30 \text{ days} = 1.4 = 2$

Required area = $2 \times 75\text{m}^2 / \text{number of gill net operators} = 150\text{m}^2$

Total required area = $2,640\text{m}^2 + 150\text{m}^2 = 2,790\text{m}^2$

(b) Open storage area

The number of off-fishing days of each fisher household will be used (5 days/month).

Number of nets = number of fishing days ($162 \times (5 \text{ days} \div 30 \text{ days}) = 27 \text{ nets}$)

Required area = $27 \text{ nets} \times \text{area of 1 net } 10\text{m}^2 = 272\text{m}^2$

(5) Fishing gear and sundry goods shop

The existing local fisheries cooperative, KUD Mina Teluk, currently operates a general sundry store near the project site where inexpensive fishing gear is sold. Therefore, a new fishing gear retail shop will not be included in the planned facilities since the existing sundry store adequately meets the needs of the fishing community.

2.3.4 Plan for Fishing Village Environment

Based on the Basic Development Concept explained in section 2.2, an infrastructure development project to control the adverse environmental impact on fishery activities and to improve the fishing village environment, and a project to improve the social environment by strengthening the self-motivation of fishermen to improve their living standards have been planned.

(1) Project to Develop the Infrastructure of Fishing Villages

1) Water supply and model toilet facilities

(a) Objectives

The goals are to improve the shortage of water to an acceptable standard and to provide model toilets that can be built by the residents as one of the measures to improve sanitation.

(b) Content and approach of the development plan

An ice-making facility will be included as part of the fisheries facilities that are planned in this project. Therefore, a water supply facility that will meet the minimum daily needs of the facilities will be installed (20L/person/day). In addition, model toilets with a washing area (the traditional kamar mandi style) will be built (two toilets: for men and women, with ceilings, stalls, tap water, and septic tank).

The construction costs of the water supply facility will be calculated as part of this mini-project, but it will be constructed as part of the overall project.

(c) Maintenance

Since the minimum required water volume can not be secured for the water facility, the village residents will decide how the water is used. In principle, a small user fee will be uniformly collected to cover the maintenance and village management costs and the remainder will be deposited in a banking account.

(d) Benefits

Village residents going to and from work at the fishery facilities will have the advantage of using these toilet facilities and they will also serve as demonstration models for other areas.

2) Road and drainage ditch in the village

(a) Objective

A paved road with a drainage ditch will vastly improve the sanitary environment of the village and expedite the transport of goods in the village. By recruiting the manual labor of the village community to implement this improvement will also heighten the residents' awareness of the need for communal efforts to improve the village environment.

(b) Content and Approach

The main road in the village will be paved (about 3m wide, 600m long). Houses do not have to be moved. The cost of the materials and equipment will be publicly funded, but the village community will provide the labor and skills.

(c) Maintenance

The community voluntary approach will be adopted and the residents living by the road will be responsible for cleaning the roadside drainage ditch on a regular basis.

(d) Benefits

The water drainage problems that occur during the rainy season will be resolved. The community will become more aware of the importance of conducting joint activities to improve the living environment of the village and to maintain the road.

3) Garbage disposal system

(a) Objective

A garbage disposal system will be created in the village aimed at improving the sanitary environment of the community. This system will be based on community participation and the objective is to raise the community awareness of the need to improve the living environment through self-help efforts.

(b) Content and approach

The existing KPP unit (village women's group) of about 10 fisher households will serve as a basic group unit. Each unit will be given a garbage box (1m x 0.5m, with lid) that will be purchased using public funds. Rompo village is comprised of 310 households, and 31 garbage boxes will be provided. The location of the garbage disposal site and how the collected garbage will be disposed of (incinerate or bury) will be decided at the village meeting. The garbage will be transported to the garbage site by horse drawn cart (benhur).

(c) Maintenance

The garbage will be collected once every two days and taken to the waiting benchur by the KPP unit. The KPP units will work on a rotational basis. The residents will pay the benchur transport cost (Rp.4,000 per round trip).

(d) Benefits

The sanitary conditions of the coast will improve since garbage will no longer be thrown in the sea.

(2) Project to develop community awareness to improve the social environment of villages

1) Develop supplementary educational material about activities to improve the social environment

(a) Objective

In implementing activities to raise community awareness for the need to improve village conditions, the common consensus expressed by the communities in all of the priority districts was, "Nobody wants to assume a leadership role, but every one will follow the decisions made by a third party about fund expenditures; and everyone is willing to provide manual labor". To change this prevailing mindset, educational activities are needed to raise the residents' awareness about the importance of community participation to improve the village environment.

(b) Content and approach

A video program on the social environmental issues that each village faces will be produced as supplementary educational material. Two extension experts from the NTB provincial Fisheries Office will be assigned for two years to work in the NTB and NTT provinces. The first half of the first year will be dedicated to defining and organizing the issues that must be addressed and to producing the video. The latter half of the first year will be spent in producing supplementary educational material. Educational materials will also be produced for the provincial extension personnel.

Educational themes: Self-help activities will include measures to improve the sanitary environment (public health, developing wastewater and water supply facilities, toilets, garbage collection and disposal system, etc.), social environment problems (gender issues, improving literacy, promoting recreation, controlling the use of firewood and introducing iron pots, measures to improve fishing income, protection of coastal resources, etc.)

Required equipment: Video (2 units), video editing unit (1 set), computers (2 units), storage cabinet (1 unit)

(c) Maintenance

The materials will be stored at the Provincial Fisheries Office and the District Fisheries Office will borrow the materials as needed.

(d) Benefits

The District Fisheries Office will strengthen the social environment awareness activities. If this project is implemented it will enable technical knowledge on developing educational materials to be transferred to the extension officers.

2) Equipment to support community awareness educational activities

(a) Objectives

The common consensus expressed by the communities in all the priority districts was, "Nobody wants to assume a leadership role, but everyone will follow the decisions made by a third party about fund expenditures, and everyone is willing to provide manual labor". To change this prevailing mindset, awareness about community participation to improve the village environment will be promoted.

(b) Content and approach

One motor vehicle for educational purposes and a video set (with microphone) will be provided as a grass roots grant-aid project for the Provincial Fisheries Office. This activity will be implemented when the supplementary educational materials have been prepared. To maintain the interest of the community residents, two topics will be introduced per trip. One trip will be for a ten-day period in one district and each district will be visited. Prior to the start of this activity, the district extension personnel will undergo a training seminar given by the extension section of the Provincial Fisheries Office.

(c) Maintenance

The materials that will be disseminated in the districts will be kept at the Provincial Fisheries Office and they will be lent to the District Fisheries Office when requested. The District Fisheries Office will pay for the driver and fuel costs, and the Provincial Fisheries Office will pay the maintenance costs of the motor vehicle.

The training seminar given by the Provincial Fisheries Office for district fisheries officers will be given once. The District Fisheries Office will pay the participant fees.

Although the seminar will introduce the video that will be used in the educational activity, the attendees will have the opportunity to exchange opinions after the showing of the video. This exchange will focus on the various means of introducing self-help efforts.

The yearly schedule for educational activities will be coordinated with the fiscal year budget of both the provincial and district Fisheries Office and the required budget will be secured.

(d) Benefits

The educational activities of the District Fisheries Office will be strengthened and the community's awareness of the importance of community participation will increase.

2.3.5 Plan for Fishermen Organization and Fisheries Extension

The objective of the plan is to organize and strengthen the fishing communities in Rompo with the aim to promote and lead them to a self-reliance organization by engaging in the planned programmes.

Self-reliance means regular meetings and group discussions to resolve existing issues, continuous growth in group savings (financial base), stable income-generating activities, less dependence on the government for subsidies and technical assistance, effective link and cooperation with other groups and organizations. The fishermen management organization can then decide to become a registered cooperative or an association in order to avail themselves of services, funds, and other benefits.

(1) Plan for Fishermen Organization

1) Background and Rationale

The fishery development programmes planned for the model site in Rompo are fisheries resource management, diversification of fishing activities to offshore waters, fish landing and transport, fresh fish handling, marketing, and processing and mini workshop for boat and engine repair and maintenance.

The fishermen and the existing organizations will play an active role in the operation and management of the planned facilities and equipment. There is presently only one cooperative (KUD Mina Teluk Waworada) in the model site. The existing cooperative is not well organized and managed and is economically inactive. Subsequently, it is necessary to form a new fishermen management organization because the community disapproves of its role in the operation and management of the programmes that are planned in this plan.

2) Proposed fishermen organization for project management

The fishing community in Waworada is in the process of forming their own association aimed at accommodating the diverse interests of the community and to help each other. Therefore, this association is recommended as the new fishermen management organization in the model site. In order not to neglect the existing cooperative, the new fishermen management organization should make use of its service in small credits and purchase/sales of general goods and fishing equipment and materials. In addition, the provincial and district fisheries offices and village administration will provide the necessary technical advice on data collection, resources management, marketing information, education/training and extension services, maintenance of facilities, arrangement of credit fund (PEMP, P4K, etc.).

The members of the new fishermen management organization will be an appropriate representation of the fishing communities in the area to ensure that the selected board members reflect this representation, that the decision-making process, the operation of the activities, and other matters concerning the management and operation of the planned programmes are conducted smoothly according to the wishes and expectations of its members. It must work closely with the communities, the existing fisheries cooperative, suppliers and relevant agencies.

The operation and management system will be implemented in two stages--the first five-year stage and second five-year stage. The first stage will necessitate appropriate extension/training, on-the-job training (OJT), guidance and supervision by the District Fisheries Office (DFO) and village administration in the management and operations of the new organization, in order to strengthen and gradually build up its viability and self-reliance.

Following the initial five-year implementation, it is expected that the fishermen management organization has become a viable and active organization through the operation of the planned programmes. This will pave the way for the management organization to become an independent and self-reliant body and to undertake confidently the management and operation of the planned programmes without relying on outside assistance. Self-reliance and achievements of the organization should be sustained and developed further thorough periodic monitoring and education/training in order to raise their entrepreneur skills and to initiate more economic activities (refer Section 2.3.6 on plan for education/training). During the second stage the district fisheries office has a role to play in monitoring and coordinating appropriate education/training needs, for which the organization should pay.

(2) Fisheries credit

The boats of Rompo in this zone are motorized to about 83 percent, and there is no need to have motorization plan in a short-term.

Despite the small credits available to meet the daily operating expenses through cooperatives, a revolving credit scheme is necessary in a long-term to purchase fishing boats in order to diversify fishing grounds. In the programme for diversification of fishing grounds, appropriate training will be provided to fishermen for modernization of fishing vessel. Thereby, there will be fishermen who will need loans to invest in the purchase of large vessels and/or engines. However, the management organization will not have adequate financial base in short term to provide loans to these fishermen. In this situation, there are two approaches; one is for the management organization to make arrangement and recommend fishermen to the local development bank, and act as guarantors for the borrowers. The other approach is to establish a revolving credit fund as one of the organization activities by mobilizing compulsory and voluntary savings and retained surpluses generated from the collection of user and service charges. This revolving fund will lead the organization to self-reliance through promoting economic activities.

A credit scheme is possible only during the later stage after sufficient funds have been accumulated. However, a credit scheme can be planned and implemented earlier during the initial stage, if there is a funding from external sources such as the local government and Dinas Koperasi. The local government and district fisheries office should make arrangements and support access to available funding sources such as PEMP fund, local development bank, etc.

When a credit scheme is set up by the management organization, it should set strict conditions for the borrowers, e.g., each borrower must be a member of the organization, participate in the economic activities, contribute to savings regularly, have a minimum of 25 percent of credit amount in savings, and others.

In the long-term the fishermen management organization should invest in the expansion of the facilities and equipment using its financial base. The management organization, therefore, should strive to become an economically active organization with a sound financial base and creditability in order to procure loans from local development bank and private banks.

(3) Fisheries extension

The fishery development programmes (sectoral improvement programs) in the priority development areas will provide appropriate extension/training for the fishermen and relevant fisheries staff during the implementation of the project. However, a preparation stage is necessary prior to the implementation (operation/management), in order to mobilize and organize the fishing community. The preparation stage will involve explaining and drawing on the community's opinions and ideas on the planned programmes in the model site, the roles and responsibilities that are expected of them in terms of operations and management, collection of service charges, formation of fishermen management organization, and others. A number of meetings and workshops will be conducted aimed at providing preliminary extension/training on leadership and management skills, accounting and bookkeeping procedures, benefits of savings/credit, and others for the fishermen, selected board members and other relevant members of the fishermen management organization. This will assist in the preparation and smooth management and operations of the planned programmes at the model site.

During the course of the implementation stage, participatory monitoring and evaluation should be implemented, which is an essential function to measure the objectives and to evaluate the activities and performance, and also to identify and resolve problems and issues. This will help the members to strengthen their problem-solving capabilities and to achieve self-reliance.

The expected outputs in the planned programme are trained fishermen, technicians and fisheries staff proficient in technical and managerial skills, and established extension procedures/methods and curricula and others. This institutional development in the priority zone (model site) will pave the way for the extending the technical and managerial experiences and skills to other areas in Bima district.

Efficient extension facilities are required to transfer the success or results achieved at the model site to the other development zones for fostering and sustaining fisheries development, particularly in terms of promoting awareness and motivation, and transfer of skills. Therefore, it is recommended that a fisheries extension unit is set up within the DFO and efforts are made to strengthen its capability in planning, formulating and implementing extension services. This unit will formulate appropriate extension plans according to the needs in the development zones in terms of target beneficiaries, source of budget, and others.

(4) Activity Plan

Before the implementation of the planned programmes, the participating members of the fishing community should be mobilized to raise awareness and understanding of the *planned programmes*, to *inform the role of the provincial and district fisheries office, village administration*, and to encourage them to play a leading and active role in the recommended management organization. The steps are to be conducted.

- Mobilization of fishermen
- Motivation workshop (create awareness)
- Formation of fishermen organization for project management
- Selection of board members
- Provision of fisheries extension (preliminary)

During the project implementation the following activities are necessary.

- Participatory monitoring and evaluation
- Periodic fisheries extension/training

The above-delineated measures must be implemented in the priority development area with the coordination, assistance and guidance of relevant agencies. The activities and agencies or parties that will be responsible for organizing and strengthening the management organizations are shown below.

1) Preparation stage

Activity	Contents of Activity	Target /Beneficiaries	Responsible Parties
General mobilization	<ul style="list-style-type: none"> Mobilize and organize meetings with fishing community to discuss and explain and draw their ideas and opinion on the followings. - Necessity of model sites and merits of its use & benefits - Problems & issues facing them, and their expectation and needs - Awareness on the benefits of mutual cooperation - Selection of interested groups or individuals for formation of planned management organization - Membership qualification (regular & associate memberships), rights, etc. - Role and responsibility in the management of facilities/equipment - Role and responsibility of local government (including DFO, village administration) - Need to collect users and service charges to cover the expenses 	<ul style="list-style-type: none"> - Participating members namely fishermen, boat owners, fish processors, fish traders, fish transporters, suppliers of fishing inputs, fish exporters, etc. 	<ul style="list-style-type: none"> - District Dinas Perikanan - District Dinas - Provincial Diklat Koperasi
Selection of members for board members, and formation of fishermen organization	<ul style="list-style-type: none"> - Explanation of selection criteria of member representative from different kelompok and villages - Explanation on the organizational set-up and expected role and tasks of board members and members - Membership qualification (regular and associate membership) and rights such as right to attend meetings and share in benefits - Members contributions (regular and voluntary payments and savings) and its uses - Organization regulations or constitution and rules needed to guide and discipline members - Formation of operation & maintenance staff for facilities and equipment, and setting of appropriate tasks of the operational body members - Recruit procedure and contracts for employed staff (operation of functional facilities & equipment) - Mobilization of capital and financial base 	<ul style="list-style-type: none"> - Participating members namely fishermen, boat owners, fish processors, fish traders, fish transporters, suppliers of fishing inputs, fish exporters, etc. - Board members 	<ul style="list-style-type: none"> - District Dinas Perikanan - District Dinas Koperasi - Provincial Diklat Koperasi - Leaders of successful organization/cooperatives
Activity	Contents of Activity	Target /Beneficiaries	Responsible Parties
Fisheries Extension (technical and managerial)	<ul style="list-style-type: none"> Leadership skills and management committee and their expected roles/duties and responsibility Accounting and record keeping (minutes of meeting, activities, contributions, income, etc.) - Technical aspects on operation and maintenance of facilities and equipment - Monitoring and evaluation capability - Small-scale credit operation 	<ul style="list-style-type: none"> - Board members - O/M staff (hired employee) 	<ul style="list-style-type: none"> - District Dinas Perikanan (should assign responsible staff members who will be monitoring and supervising -- he will also be learning on the job.) - Local District Development Bank - Diklat Koperasi

2) Implementation stages

Activity	Contents of Activity	Target /Beneficiaries	Responsible Parties
Participatory Monitoring and Evaluation	Awareness on the importance of M & E Procedure/Tools of M & E - What info/data and collection method - Work plan and record keeping - Analysis and problem solving Monitoring to be conducted by participating members and assisted by resident fisheries officer Evaluation to be conducted by fisheries staff from outside	- Board members - O/M staff (hired employees)	- District Dinas Perikanan (should assign responsible staff members who will be monitoring and supervising – he will also be learning on the job.)
Extension/Training (Periodically)	Supplementary extension/training needs depending on the results of participatory monitoring and requests by fishermen and resident fisheries officers at sites.	- Fishing community - Board members - O/M staff (hired employees)	- District Dinas Perikanan

2.3.6 Plan for Education and Training

(1) Background

Lack of adequate, appropriate and timely education and training for fishermen and the lack of skilled manpower and extension activities in fisheries have led to problems and issues that have hindered the development of small scale fisheries and the progress of the existing fishermen organizations. The provision of education and training for the fishing communities and fisheries staff is essential in order to implement the planned programmes in the priority zones that are aimed to enable the users to utilize the planned facilities/equipment and services to achieve the anticipated results. Therefore, in the sectoral improvement plans in the priority zones, appropriate extension and training activities, including OJT will be conducted to achieve effective and efficient use of the planned facilities and equipment. The extension/training activities that will be conducted in the first implementation stage are as follows.

- Data collection system
- Fishing techniques to diversify fishing grounds
- Fish handling, quality preservation, etc.
- Fish processing and developing new products
- Administrative and management skills of fishermen organization

(2) Objective

The objectives of the plan for fisheries education and training are

- to develop human resources using the planned programmes to improve the consciousness, attitude and activities of the targeted beneficiaries such as fishermen, fish traders, fish processors in order to ensure the sustained development and management of the project.
- to foster and strengthen the core members of the fishermen organization and concerned fisheries staff in business management in order to widen their vision in economic activities.

(3) Development approach

The extension/training activities in the planned programmes are short-term and minimal since their aim is to meet the immediate needs and to improve the users' performance on the job. Hence, in order to improve and sustain the development of the project on a long-term basis, education and training have to be imparted to the fishing communities and fisheries officers on a need-as-basis as the project is implemented. The proposed approach for education and training is as follows.

- Education/training on fishing technology, resource conservation/management, fish marketing, new products development, administrative/management skills must be provided under the project by utilizing the courses and programmes available in relevant institutions and agencies such as Dinas Perikanan, Diklat Koperasi, BIPP, IPPTP, etc.
- The district Fisheries Office must identify the training/education needs of the targeted groups, and must organize and coordinate their efforts with the relevant institutions and agencies to provide the education/training.
- The education/training programme must be provided on regular and timely manner, and must emphasize practical training including OJT, and dissemination to others.

(4) Proposed Education and Training Plan

The education and training needs in the model site will depend on the impact and the results that are achieved through extension and training (OJT) conducted during the course of the implementation. Participating members and core staff of fishermen organization will be organized and trained in monitoring and evaluation to be done in a way to suit their skills. This monitoring and evaluation conducted periodically during the implementation of the planned programmes will identify the education and training needs of fishermen and fisheries staff. However, taking into consideration the existing conditions and issues facing coastal fisheries, the following education and training measures are proposed.

1) Fishing technology & coastal resource management

OJT will be conducted on modernization of fishing boats and offshore fishing techniques including awareness to resource management and fish catch data recording procedures, etc. In addition, selected fishermen in each model site will be provided with education/training on general fishing technology, resource management technology, etc.

Target groups	Method of education/training	Training period	Implementing agency
- Selected fishermen (4 persons) - Fisheries staff (2 persons)	- Study tour and exposure to well organized and implemented resource management, e.g. CO-FISH project in Lombok, TNC Labuan Bajo, or COREMAP in Maumere - Selected fishermen and fisheries staff are expected to disseminate skills and knowledge gained to their fishing community.	6 days a year (for three years only)	District fisheries office

2) Fishing marketing and processing

OJT on improving fresh fish marketing, developing new fish products, etc. is imparted during management and operation.

Supplementary education and training on sanitation & hygiene, handling, preservation will be provided.

Target groups	Method of education/training	Training period	Implementing agency
- Fishermen, fish traders, employed staff of O/M	- Short training courses (using charts, hand-outs) including practices - To be conducted at model site	5-day course (once a year starting from sixth year of implementation)	District fisheries office

3) Strengthening of fishermen organization

OJT will be imparted during implementation and it will cover general administrative and management skills. Further, an intensive short-training course for management staff will be conducted using programmes developed by Diklat Koperasi (Mataram) and Dinas Koperasi, to widen their vision in business activity.

Target groups	Method of education/training	Training period	Implementing agency
- Board members of fishermen organization	- Short training courses for management staff (using programs developed by Diklat Koperasi) on administrative, management and leadership skill - To be conducted at model site	One week a year (fourth year and eighth year of implementation)	- Diklat Koperasi (Mataram) - District Diklat Koperasi

4) Fisheries extension unit (within District Fisheries Office)

Set up an extension unit within fisheries office to foster fisheries extension staff with skills and knowledge, and with ability to plan, formulate and implement continuous extension services. Appropriate education on subject matters (including on monitoring and evaluation method) are to be provided to staff engaged in extension/training.

Target groups	Method of education/training	Training period	Implementing agency
- Selected fisheries staff (3 persons)	- Education/training course offered in training institutions in Indonesia - Study tour and field observations	Two times during the implementation period after the set up of the extension unit	- Diklat and BIPP (Extension and monitoring & evaluation) - Semarang Training Center (Fishing & Resource Management) - Co-Fish Project (Resource Management)

2.3.7 Summary of Projects in Sector Plan

The summary of projects by sectors (2.3.1 ~ 2.3.6) is shown in the following pages.

2.3.7 Project Summary of Sector Plan

Sector Plan	Name of Project	Project Contents	
		Rompo Site	Bima Market Site
Plan of Coastal Resources Management	A. Project of Data Collection System Improvement	Technical Assistance for Fishery Management (Improvement of log book format, recording of fishing operation by fishermen, data collection / analysis, etc.)	-
	B. Project of Fishery Licensing System Expansion	Technical assistance for renewal of fishing boat list, issuance of fishing license, license fee collection, formulation of boat construction permit system, marking of fishing boat, etc.	-
	C. Project of Fishing Ground Expansion Promotion C-1. Offshore Fishing Ground Set Up C-2. Modernization / Up Sizing of Fishing Vessel	Installation of FAD and technical assistance of artificial reef Provision of model fishing boat, and training of fishermen Extension support on application of existing credit system for motorization of existing boats (small engine, gill net and trolling)	-
	D. Project of Monitoring System of Coastal Fishing Ground D-1. Provision of Marine Communication Network D-2. Set Up of Monitoring of FAD Base System against Illegal Fishing D-3. Set Up of Enforcement System against Illegal Fishing D-4. Model Project of Formulation of Community Rules for Coastal Fishery Management by Community People	Provision of VHF radio Technical assistance of monitoring activities of illegal fishing by using FAD base Provision of speed boat Technical assistance	-
Plan of Landing, Handling, Shipment and Processing	A. Project of Fish Landing / Handling Improvement	Provision of fish landing facilities (Wave protection, Landing wharf, plastic containers) Provision of fish handling facilities (Fish handling space, scales)	-
	B. Project of Fresh Fish Shipment Improvement B-1 Ice making and storage B-2 Insulated boxes and storage area creation B-3 Fish transport vehicle B-4 Communication facility	Provision of ice plant / storage Provision of cool box and storage space Provision of fish transport vehicle Provision of SSB radio and VHF radio	-
	C. Project of fresh fish handling extension	Extension of utilization of cool box by users (demonstration, test use and rental of cool box, training of making hand made cool box,)	-
	D. Project of Fish Processing Improvement D-1. Model Processing Facilities for Local Women D-2. Pilot Test / training for Extension of Fish Processing Technology	Provision of fish processing facilities (space for cutting, and washing, improved kern and dry stall, processing room, etc. Technical assistance of technology improvement and extension activities	-
	E Project of Bima Fish Market Improvement	-	Provision of fish whole sale and retail market

Sector Plan	Name of Project	Project Contents	
		Rompo site	Bima market site
Plan of Fishery Activities Support		Provision of workshop, fuel supply and water supply facilities, space for net repair and stock yard	-
Plan of Community Environmental Improvement	. Project of Community Infrastructure Improvement A-1. Model Water Supply / Toilet A-2. Community road Improvement A-2. Garbage Collection System	Provision of model bath (kamar-mandi) with water supply / drainage Provision of construction material for improvement of community road with drainage ditch, and technical advice Provision of garbage bin and extension of collection system	-
	B. Project of Upgrading Motivation of Community People on Social Environment Improvement B-1. Provision of Audio Visual Education Material for Extension of Social Environmental B-2. Provision of Equipment for Community Improvement Education Support	Technical assistance for making education materials and its guidance, and provision of necessary equipment (collaboration with provincial fishery office) Provision of vehicle and audio visual equipment for extension of community improvement (Rental from provincial fishery office)	-
Plan of Fishermen Organization / Fishery Extension Improvement		Mobilization of fishermen organization for O/M of planned program, training of participatory monitoring and evaluation of OM.	-
Plan of Fishermen Education /Training		Education/training for strengthening of capability of fishermen leaders and fishery extension staff, and for supplementary technical knowledge	-