

V-2 DOMPU PRIORITY ZONE
Model Sites: Soro and Hu'u

1. Background of the Dompu Priority Zone

1.1 Situation of Priority Zone

1.1.1 Natural Conditions

(1) Condition Surrounding the Locations

Dompu District is situated in the central part of Sumbawa Island, with the Flores Sea to the north and the majority of the western side on Saleh Bay (the mouth empties into the Flores Sea). It faces Cempi Bay to the south (the mouth of which empties into the Indian Ocean). The east side is bounded by Bima District and part of the west side borders Sumbawa District. The boundary with Sumbawa District runs through the middle of Saleh Bay.

The district capital, Dompu, lies inland and is the center of the local government and economy, the largest consumer area in the zone. The Soro site belongs to Soro Village in Kempo Sub-District and it is the largest fishing community in the Saleh Bay region. In addition, small, isolated fishing villages are distributed along the bay. On the eastern shore of Cempi Bay are, going north to south, the fishing villages of Jambu, Soroadu, Woworoi, Jala, Nangahare, and Hu'u. The southernmost village, the Hu'u Site, is part of Hu'u village in Hu'u Sub-District, and it is located near the mouth of the bay. Lakei, situated south of Hu'u, is a world-famous surfing point, due to the long-cycle waves from the Indian Ocean that hit it directly.

(2) Weather Conditions

The weather conditions in Dompu District, the annual weather pattern may be broadly divided into a dry season, lasting from May to September, and a rainy season, last from October to April. During the rainy season, rain falls more than twenty days per month, while in the dry season it does not rain at all. The monthly precipitation during the rainy season is 200-300 mm per month, and the annual rainfall volume averages 1,400 mm. Precipitation conditions in Dompu Sub-District and Kempo Sub-District are nearly identical, but Hu'u's weather is characterized by more rainfall, nearly 2,000 mm annually. The five-year average from 1995 to 1999 shows a similar pattern, and it can safely be said that Hu'u Sub-District gets more precipitation than anywhere else in the district (see Appendix 7: Tables 7.2.1-7.2.3.)

(3) Topographical and Geological Conditions

Saleh Bay, where the Soro Site is located, has the largest surface area of any bay in NTB Province, and its maximum depth exceeds 300 meters. Moyo Island is situated at the mouth of the bay, forming an enclosed. Soro is oriented east to west on the northern side of the inner part of Saleh Bay, and at ebb tide, the sea floor is exposed 100 meters offshore. A certain amount of littoral drift can be seen as far as the PPI gravity-type jetty (extending 60 m) located to the west of the shoreline. The sub-villages stretching approximately 1.3 km along the shoreline are located on shallow beaches, as described above, but all along the shoreline simple sea walls of piled stones have been erected.

On the other hand, Cempi Bay on the south coast is shallow, 20m or less from its center to its interior, but it is 50 to 100 meters at its mouth in the vicinity of Hu'u, and 100 to 200 meters on the southern edge of the mouth. Lying on the east side of the mouth of the bay, Hu'u is oriented north to south along a shore composed of a mixture of sand beaches and gravel. Southwest of the sub-village stretches a cape formed from a terrace-shaped reef, which blocks surges. The sub-village fronts a sand beach, which waves attack directly, but part of the site inside the cape is protected from surges and is a gravel beach.

(4) Ocean Conditions

Since Moyo Island blocks the mouth of Saleh Bay and creates an enclosed bay, the waters around Soro are calm. The proposed site is situated on the western edge of the shoreline, and west winds are usually blocked by the cape to the west. It is estimated that from the southwest, waves are diffracted by the tip of the cape, are further refracted by sea floor formations, and break from the south. However, these wind waves arise within the bay and are not the kinds of surges that would keep the fishing boats in port.

On the other hand, Cempi Bay, where Hu'u is located, opens to the south, so it is beset by long-cycle swells from the Sabu Sea and the Indian Ocean. Since the eastern shore where the village is situated is a smooth, shallow beach, even surges break at the shoreline. The motorized fishing boats are capable of anchoring offshore, but rough conditions impede the fish transport by small, non-motorized sampans. Looking at ocean conditions on a seasonal basis, when the prevailing winds come from the east by south-east monsoon from April to August, there are many surges, and it is possible to fish, but it is difficult for the small, non-motorized sampans to transport the catch, and they may even capsize at the water's edge. When the prevailing winds are from the west in December through March (north-west monsoon), there is no surge effect, and yet, due to strong winds, all the fish catch is landed in the area inside the cape.

The cape blocks surges that enter through the mouth of the bay and after being deformed by diffraction and refraction, they approach the beach at an angle, so the proposed site is not assaulted by high waves. Swells come from the north to attack the beach. The beach is composed of 5 to 10 cm of gravel. It is assumed that the sand has been shifted northward by the diagonal action of the waves and only gravel remains.

Based on the tide levels (HWL: +3.12 m) and the results of the field survey and interviews of fishermen, the run-up height of surges in the proposed project site is estimated at about +3.5 to +3.7m, even with high waves.

Observations of tide levels at Soro and Hu'u yielded the following results.

Site	LWL	MWL	HWL	Source
Soro	±0.00	+1.10	+2.20	On site monitoring
Hu'u	±0.00	+1.56	+3.12	On site monitoring

(5) Land Use

Soro is the largest fishery base in the area, with large, dense settlements stretching about 1.3 km from east to west along the shorelines. The buildings in the sub-villages are huddled close together, and there is no room for public open spaces, but there is a broad natural sand beach in the vicinity of the existing PPI at the western edge, and its land area is government property. The shoreline in front of the sub-village is marked off for individuals by simple seawalls of piled stone, so access from the crowded sub-village to the shoreline is difficult. At the eastern edge of the village, the main road is only 30m away from the shoreline, and part of the open space serves as both a fishing boat construction area and access to the sea. The western sub-village is more than 100m from the main road, and there is no public access to the sea. A paved path about 1 meter wide passes through the central sub-village. Since there is no room for fishing-related activities, boat building and repair and equipment repairs occur under the houses. With the houses packed so close together, access between them and the sea is difficult, and causes problems with transport.

On the other hand, Hu'u consists of fishermen's houses spread out over a wide area

from the shoreline inland, and it has more land left over than Soro. The inner side of the cape, an area for which facilities are planned, is covered with privately owned fields.

1.1.2 Social Infrastructure

(1) Road and Traffic Conditions

The main road in Dompu District is a national highway running east-west to link Bima District with Sumbawa District by way of Dompu. It is about a 40-minute drive from Dompu to Soro, and from Dompu to Hu'u, it is about a 1-hour drive, and there are roads to both locations. Roads are the main transportation facilities within Dompu District, and air travel is available at the Bima Airport in neighbouring Bima District. In addition there is a small harbour that handles cargo at the western edge of Soro.

District and sub-district functions are concentrated in Dompu, and all the major roads pass through Dompu. In Soro, a road runs out of Dompu through the sub-villages, and in addition to being used as the main road for the area, a road linking the sub-villages and the project site is already in place. By bus, the public transport medium for the area, Dompu is one hour away. In Hu'u as well, the road running out of Dompu (national highway) passes through the sub-villages, but the road that links the national highway to the proposed project site at the inner side of the cape (a village road, about 740 m in length) is unpaved and floods during the rainy season, while the part along the shore is in poor condition due to erosion of the shoreline. As in Soro, it takes about an hour to reach Dompu by bus, and the fare is Rp. 4,000 per person.

(2) Public Facilities

Since Dompu is the district capital, all functions are concentrated there, and every type of public facility is available. The public facilities in Soro are the Soro Village Hall, a small market, and a primary school, and the village hall is used for village meetings. Since no water supply has been provided by PDAM, wells have been installed in 13 locations to provide water for everyday life, with about 70 households using each one. In addition, a communal toilet has been provided for each sub-village. In addition to the Hu'u village hall, Hu'u contains a primary school. There are two communal toilets, but since no water supply has been laid in, people must bring their own water, and the toilets are not used very frequently. Neither electricity nor running water is well-provided for in the proposed project area on the inner side of the cape.

Data on the electricity and water supplies and communications at each site are shown in the table below.

Electricity and Water Supplies and Communications			
Site	Electricity	Water	Communications
Soro	Supplied by PLN, 24 hours	No water supply. 13 wells provide water for everyday needs (average of 70 households per well). However, since water quality is poor, drinking water needs to be boiled.	Telephone facilities exist
Hu'u	Supplied by PLN, 24 hours	A PDAM water supply pipe has been laid in along the road, but only 67 of the 546 houses in the village (about 12%) are connected to it. There are 30 wells.	Telephone facilities exist
Dompu	Supplied by PLN, 24 hours	Water provided by PDAM	Telephone facilities exist

1.1.3 Fishery Related Facilities

At Soro, a PPI was built on a sand beach about 1 km west of the sub-village in 1983, but the facility has deteriorated and broken down and is not used at all.

A jetty (60 meters long) located about 0.5 above sea level still exists, but the land-based facilities are severely damaged and unusable. One of the conceivable reasons that the existing PPI is no longer used is that the 60-meter jetty is 0.5 meters higher than tide level (HWL +2.20 m), so according to the average draft of the fishing boats (about 1.5 m), the jetty is unusable except at high tide. With the jetty in its current position, the fishing boats must anchor offshore and the catch must be transported to the jetty by small, non-motorized sampans, so there is no advantage to using the PPI. In addition, the village of Soro at the western end of the sub-village has built a simple wooden pier with a subsidy from the provincial government, but since it is situated in a shallow position like the aforementioned PPI, it is not used at all, since the required water depth cannot be guaranteed. In Hu'u, a small TPI (fish auction site) has been set up along the beach road, and it has become the center of fishing activities for the village.

Other facilities in the Dompu District include a TPI in Soroado deep inside Cempi Bay, with a T-shaped pier (1998) and an auction site (1999). Tide levels vary greatly, and it is difficult to use the pier at low tide. In addition, distribution facilities, especially ice-making equipment, are inadequate, so fish traders do not gather there, and no distribution system has been set up. For these reasons, the fishermen do not land their catch here, and at present, the facility is used as a shelter area during surges.

1.2 Fisheries Conditions

1.2.1 Overview of Fishing Village

Soro, one of the model sites for this project, is situated on the southernmost part of Saleh Bay, while Hu'u, the other site, is on Cempi Bay. The combined population of Soro and Hu'u is 65,000 (about 16,000 households), accounting for about one-third of the total population of Dompu District. The overwhelming majority of the population belongs to the Dompu ethnic group, who are adherent of Islam. The district is adjacent to Bima and its economy is strongly influenced by Bima. Soro is about a 30-minute drive, and Hu'u is a one-hour drive from the district capital of Dompu. It is also about one hour to the neighboring district capital of Bima, and transportation networks are fairly well developed. Local agricultural and marine products are shipped to markets in both Dompu and Bima.

The model sites included in this zone are the village of Soro in Kempo Sub-District and the village of Hu'u in Hu'u Sub-District. They are the main fish landing sites of the Saleh Bay area and the Cempi Bay area, respectively. A summary of these two fishing villages is shown in the table below.

Model site	Admin. Village	Fishermen's villages	RT	Households (Fishermen households)	fishermen's groups	women's groups	Fishermen's cooperatives (Members)
Soro	Soro	Nciu	2	(445)	3	2	1
		Kajenje	2	(233)	2	2	(440)
		Karama	2	(423)	3	2	
		Total	6	1,101	8	6	
Hu'u	Hu'u	Labuhan	3	87 (13)	-	-	
		Sigi	2	105 (12)	-	-	1
		Mamboa	3	160 (13)	-	-	(219)
		Finis	2	114 (30)	-	-	
		Nanga Doro	2	80 (5)	-	-	
		Total	3	546 (73)	-	-	

Source: Dompu District Fishery Office, Kempo Sub-District Office, Hu'u Sub-District Office

While almost all the inhabitants of Soro depend on fishing for their livelihood, the percentage of full-time fishermen in Hu'u is low, despite the fact that the fishing sub-village is located along the shoreline. Most people spend half their time on agriculture and half their time on fishing. The inhabitants of both areas are a mixture of the Dompu ethnic group and the Bajo ethnic group.

1.2.2 Fishing Activities

(1) Major Fishing Methods and Fishing Boats

The major fishing method used in Saleh Bay by motorized fishing boats is Bagan (33 boats), followed by purse seine (10 boats), gill net (14 boats), and angling. The situation is similar in Soro (Kempo), the Bagan boats are all large vessels at least 20 meters long and equipped with generators and fishing lamps. The purse seiners are the largest in the Sumbawa-Flores region, 12 to 15 meters long. Nearly all the catch of the Bagan boats and the purse seiners is sold at sea to local fish collection boats (8-9 meters) that collect the fish catch at night. The highest prices are received for fish brought back to the village and sold to fish traders, but by selling to the fish collection boats, the fishermen can avoid the risk of the catch losing its freshness on board, and above all, they are in a mutually beneficial relationship with the cargo boat operators, local people whom they have known all their lives. The Bagan and purse seine fishermen of the area return with only the last fish catch back to their village for personal consumption or to supply to retailers or processors.

In terms of resources, Saleh is a large bay with a huge surface area, but its entrance is narrow and shallow, with a maximum depth of 100m, so that the area has become a breeding ground for small pelagic and demersal fish, as well as a favorable fishing area for Bagan boats and purse seiners. Even so, the amount of fish landed has remained stagnant for several years, and the sizes of the individual fish are small. Therefore, it is assumed that the maximum catch limit has already been reached, and it would be desirable to impose catch restrictions under appropriate resources management, set up a fishing base at Pekat in Dompu District at the mouth of Saleh Bay, and shift the development of the fishery from the mouth of the bay to offshore waters.

In Cempi Bay toward the south, most of the fishing boats are purse seiners, with the rest being gill net or angling boats. Fourteen purse seiners and 9 gill net boats operate in the model site village of Hu'u, which is the southernmost fishing base on the east side of Cempi Bay. Farther into the bay are other landing facilities, such as Nangananae, which is mostly devoted to harvesting prawns, and Soroadu, where the fishing patterns are similar to those of Hu'u, but Hu'u is closest to the fishing grounds for pelagic fish and is in the most advantageous position for purse seine and gill net operations to harvest these species. Although small fishing communities are scattered along the western coast of Cempi Bay (Sumbawa District) toward the southern edge of Sumbawa Island, none of them are landing spots large enough to serve as a base. For these reasons, the model site of Hu'u enjoys the most geographically favorable conditions for developing the unexploited resources on the southern shore of Sumbawa Island in the future.

(2) Fishing Boat Operations and Fishing Seasons

In Soro, the Bagan boats and purse seiners all operate at night using fishing lamps. On the other hand, purse seiners in Hu'u on Cempi Bay operate only during the day and scout for fish by finding shoals with girds, but the gill net and angling boats operate mostly at night. (For details, see Appendix 1: Fig. 1-1).

The fishing season in both Saleh Bay and Cempi Bay is between March and

December, and irrespective of the fishing method, the fish catch is the largest from June to September in Soro and from May to July in Cempi. The catch decreases at both sites in January and February, during the northwest monsoon. In particular, the majority of purse seiners from Hu'u, like those in Waworada, Bima District, shift their bases to Sape (the Sape Straits) in Bima District or Alas in Sumbawa District. Conversely, if there are rumors of abundant fishing during the May to July period, up to 50 purse seiners flock from Sape, Waworada, and Sumbawa for about a week of fishing. In Hu'u, seas are rough in July and August, due to the effects of the southeast monsoon, and even though the number of fishing days is limited, large harvests are produced on most days, so the total number of fish landed does not decrease. (For details on the estimates and baseline data on the number and frequency of boats going out, and the units of fish landed, see Appendix 1: Table 1-10. See Appendix 1: Figures 1-1 and 1-2 for fishing pattern, seasonal fluctuations in fish landing volume.)

In Soro as well, unstable weather conditions in January and February cause a broad reduction in the number of fishing days, but, the fishermen in that area do not shift their fishing activities to other areas but occupy themselves with repairing their boats or rest and recreation, live on their savings.

(3) Fish Species

Fishing in Saleh Bay focuses on small pelagic fish, while fishing in Cempi Bay focuses on large migratory fish, and the composition of the fish catch in the two bays shows clear differences. The principal species landed in Soro on Saleh Bay are sardines (28%), fusiliers (19%), ponyfish (17%), frigate tuna (6%), and round scad (4%), so that about 75% of the catch is small pelagic fish, a high percentage compared to the 20 percent for demersal fish. On the other hand, large migratory fish such as frigate tuna (18%), marlin (16%), bonito (15%), and tuna (15%) make up the largest portion of the catch in Hu'u, near the mouth of Cempi Bay, and small pelagic fish, such as round scad (10%) and ponyfish (9%), are only about 25% of the total.

(4) Procurement and Maintenance of Fishing Equipment

The fishing equipment and netting materials currently used in both Soro and Hu'u can be purchased in shops in Dompu or Bima. In Soro, the local cooperative pools resources to buy equipment and sell it in the cooperative's store. Almost all the engines used in fishing boats are the Chinese-manufactured Dong Feng brand engines, and there is no problem obtaining spare parts.

1.2.3 Fish Marketing, Processing and Shipping

(1) General

Supplies of fish for Dompu District come mainly from two places, Soro on the shore of Saleh Bay and Hu'u on Cempi Bay, with small amounts coming from two other fishing bases within district waters: Kilo on the Flores Sea and Pekat on the tip of the Tambora Peninsula at the mouth of Saleh Bay.

The fish catch is mostly shipped to market in the district capital of Dompu. During the peak fishing seasons, about half of the catch is sent to be salted and dried or salt broiled. During the height of the northwest monsoon in January and February of each year, however, the number of fish landed in the District decreases, so supplies of fresh fish come mainly from Sape in Bima District.

The model sites of Soro and Hu'u are the two major bases for supplying fresh fish to

the markets in Dompou, with the former supplying mostly small pelagic fish and the latter supplying mostly large migratory fish, giving the market a relatively diverse assortment of fish species.

(2) Fish Transactions

1) Soro (Kempo)

Almost all the catches of the Bagan boats and purse seiners are bought at sea by local fish collection boats (80 vessels).

Each collection boat holds about 50 to 60 plastic 30-kg containers, and a typical day's catch fills about 20 containers. The prices for transactions between the fishing boats and the fish collection boats are based on a mutual understanding of the day's catch and the amount collected, and the fish catch is negotiated on the spot. There are no contracts of any sort between the fishing boats and the fish collection boats. The fishermen negotiate on an equal footing with any of a number of fish collection boats.

After buying the fish at sea, the fish collection boats take and unload them at their homes located on the village waterfront. There they are sold wholesale to waiting fish traders and retailers who have come from the local area and Dompou. The catch is usually landed from the fish collection boats between 2:00 A.M. and 7:00 A.M. every day.

The fish contained in the 30 kg plastic containers are first divided up into three 10 kg containers. They are handed over from husbands (the fish collectors) to wives at a price 1.5 to 2 times higher than that paid to the fisherman. The wives then sell the containers wholesale at a price that is about Rp. 5,000 higher than that to the fish traders and retailers who have gathered in the house. The fish traders and retailers immediately take the fish they have purchased, a small amount (about 20%) of ice in plastic bags, and transport them by scheduled bus to the market in Dompou, where they sell them to customers. The retail price is about twice the purchase price.

2) Hu'u

Each fishing boat lands its catch directly. There are two beaches that serve as landing sites, and they change according to the marine conditions on a particular day. The wife of the boat's captain has the right to market the fish, and she negotiates the price with retailers on the beach. In the transactions on the beach, the units are individual fish, regardless of the species.

If the catch is small, the retailers market the fish locally. If it is large, they transport them to Dompou or Bima by scheduled bus.

There is also one fish collector who handles fish mostly for local consumption, and generally purchases the entire fish catch of one boat directly from the fishermen.

There is no one in Hu'u, who handles demersal fish for export, but there are fish collectors who handle exported prawns in Nanganæ farther into the bay and fish collectors dealing in exported demersal fish in Soroadu, and both of them acquire fish in cooperation with small-scale fishermen.

(3) Fish Collectors

Using the methods shown in Appendix 1 and the findings of a counting survey carried out in February 2002, the average number of fish traders and retailers as well as the daily fish catch volume (fresh fish only) during the peak fishing season at each model site were calculated. The results are shown in the table below (see Appendix 1: Table 1-5).

	Soro fish landing area			Hu'u fish landing area			Dompu market (reference)		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
Number of persons	36	108	144	16	11	27	0	150	100
Transactions (kg/day)	1,950	6,917	8,868	740	514	1,254	0	7,958	7,958
Average(kg/person/day)	54	64	62	46	47	46	0	53	53

In Soro, 75 percent of the fish traders and retailers were women, but slightly more men than women were engaged in these trades in Hu'u. In the field survey, almost all the fish traders and retailers at both sites were women, and all were women at the Dompu market, the final destination of the fish catch. However, it was inferred that there actually were male retailers who were in charge of marketing fish to the villages in the area. By the amount handled, 90 percent of the fish traders and retailers in Soro and all the fish traders and retailers in Hu'u were small-scale operators who handled 100kg or less per day. Note, however, that in Soro, a small number of fish traders (about 10 percent), handled 30 percent of the fish catch in lots of 100kg or more. These were sold wholesale to retailers in Dompu market.

(4) Fish Processing

The main processed marine products in this zone are salted and dried fish in Soro, where the catch is mostly small pelagic fish. In Hu'u, where the catch is mostly large migratory fish, frigate tuna and bonito are salt broiled (a special product of Hu'u and Waworada, Bima District). Since the peak fishing season corresponds to the dry season, it is seldom affected by rain, but since it overlaps with the peak fishing season in the surrounding areas, prices are low. In addition, family labor and processing sites are limited during the peak fishing season, so the inability to process the catch appropriately can lead to a decrease in quality. The distribution ratio of fresh fish is estimated to be 59 percent in Soro and 57 percent in Hu'u, but at both sites, about 11 percent of the daily catch (about 19 percent of the fresh fish distributed) could not be sold, due to daily fluctuations in the volume of fish landed, and it is assumed that this leads to economic losses (see Appendix 1: Table 1-11).

(5) Fish Price

Landing price of the fish catch varies depending on the season and the phase of the moon, which particularly affect the fish catch volume that is supplied to the Dompu market. Most of the fish shipped to the Dompu market are landed at Soro and Hu'u, and during the lean fishing season (January and February), fish is procured from Sape, which is not affected by the northwest monsoon. During the lean season, a greater volume of dried fish than fresh fish is marketed, and it is generally known that the quality of dried fish produced during this period is low due to the effects of the rainy season. This also affects the beach price of fresh fish. Hence, in Soro, which follows fishing patterns similar to those of Sape, beach prices are low between November and April, when the catch is small, and conversely, high from May to October when the catch is large (see Appendix 1: Table 1-8).

However, in Hu'u, where most of the fish catch is large migratory fish, beach prices are low during the peak fishing season between May and July and high in the lean season between December and February. In addition, in Soro, where the Bagan boats and purse seiners operate at night, the catch landed varies greatly from day to day, and around the time of the new moon, when the harvest is large, the beach prices drop sharply. The effects of this decrease also extend to other species of fish. Dompu is also close to the Bima market, and the existence of two consumption markets in a small area means that market prices for fresh fish are affected not only by the catch landed in the district, but also by trends in the number of

fish landed in the surrounding regions, as well as by the amount of dried fish in stock.

(6) Retail Market in Dompu

The Dompu is the largest consumer city in the district, and a major shipping destination for both model sites.

At present, Dompu has one retail market at its center, the Pasar Dompu. On a typical day, between 50 and 100 retailers (an average of 150 per day during the peak fishing season) sell fresh fish in this market, and it is estimated that between 4 and 8 tons of fresh fish are sold here each day (see Appendix 1: Table 1-5). The market is supplied with fish early in the morning, with fish traders transporting the fish from Soro and Hu'u by truck or bus and selling them wholesale to retailers in Dompu or retailing them directly.

The space occupied by this market is small, considering its urban location, and fish is sold along a narrow passageway or in cramped open-air space. Most of the retailers spread a plastic sheet on the ground and sell the fish from there, but since the surface is unpaved and lacks drainage ditches, it turns into mud after a rainfall, and retailers are forced to sell fresh fish in the worst possible conditions. From the customers' point of view, this is an extremely unsanitary and inaccessible environment. Furthermore, a large number of horse-drawn vehicles (Benhol) are parked along the roads, which further impedes the traffic.

In order to alleviate these problems, the district government is reviewing the feasibility of setting up a wholesale market at the agricultural market in the vicinity of the Ginte bus terminal 3 km from the center of the city, but there are no specific plans.

The present agricultural market is under the jurisdiction of the Dinas Pendapatan (Income Office) and it contains the following facilities, which are hardly used:

- 2 hectares of land (owned by the government)
- a parking lot
- a water tank
- public toilets
- kiosks (5 booths x 2 roofs = 10 booths)
- retail facilities (2 buildings x 12m x 6m = 144 square meters)

1.2.4 Mariculture

Most of the aquaculture in Dompu District consists of culturing prawns and milkfish in estuary ponds. The Brang Nae River, which has a relatively large drainage area, flows into Cempi Bay in the south, and it is famous as an area for breeding prawns to use in marine culture. The coastline is mostly formed of low, swampy land, but most of it has already been developed for estuary cultivation, and only mangrove forests remain. A number of private prawn culture operators are in operation, and they supply young prawns to these estuary ponds. There is a large gap between the productivity of the estuary ponds managed by the fishermen and those managed privately. The productivity of the fishermen who engage in traditional, extensive culture (a mixture of prawns and milkfish) is low, about 150 to 200 kg/hectare/cycle, while semi-intensive methods that combine fertilization and feeding yield 300 to 600 kg/hectare/cycle. Intensive methods (for prawns only) in which private entrepreneurs thoroughly manage water quality and feeding, are highly productive, yielding 2 to 4 tons/hectare/cycle. Under all these methods, it is possible to obtain two harvests per year.

At present, mariculture cannot be said to have achieved its full potential growth. Private entrepreneurs have set up operations in only in one site on the north coast facing the

Flores Sea and one site in Saleh Bay. The only other example of mariculture is a seaweed cultivation project by fishermen in the southern part of Saleh Bay. The District Fisheries Office experimented with culture of sea cucumbers in the northern part of the bay in 1995 and the culture of mud crabs in Cempi in 1998, but both attempts ended in failure.

Saleh Bay, with a far larger water surface area than other bays on Sumbawa Island is believed to hold latent possibilities for mariculture, but so far, the fishermen have not cultivated anything but seaweed. The southern part of the bay has a relatively large proportion of tidal flats, but at present, these areas are not being put to effective use.

In 2002, the NTB Province Fisheries Office and the District Fisheries Office plan to institute a joint extension project for floating cage culture of grouper and lobster in Saleh Bay. The personnel have already completed training at the Situbondo Estuary Cultivation Center under the auspices of the Marine Culture Bureau, but this training has been mostly technical, concentrating on matters such as how to rear the fish. There has been no administrative training, such as managing cash flow and personnel turnover until the fish are harvested.

(1) Seaweed Cultivation

Most seaweed cultivation takes place at the Soro model site. In 2000, the village received assistance from the District Fisheries Office to establish a kelompok with 35 members chosen from fishermen who were already engaged in seaweed cultivation. During the month of May 2001, 64 tons of seaweed was produced in Soro. As of the end of 2001, 164 households were engaged in seaweed cultivation.

Ciu sub-village	68
Kajenje sub-village	60
Soro Barat sub-village	6
Karama sub-village	30
Total	164

The most commonly used cultivation method is the longline method, and the most productive months of the year are May to July. In September, production is 25 percent less than the peak harvest season. This period of low production continues until the end of the year, and production begins to rise in January and February.

After drying their crop, the fishermen households that cultivate seaweed sell it to the collector in each sub-village, who in turn sells it to buyers from processing companies. The processing companies support none of the fishermen households that cultivate seaweed, nor are they in any kind of a contractual relation with the collectors, so they are free to sell their crop to the collector that offers the best price. The business conditions for seaweed culture are similar to those in the Waworada zone, and it is believed that cultivators can recoup their initial investment after about five harvests. This makes it an easy business for small-scale fishermen to enter.

(2) Issues

As in the Waworada zone, seaweed cultivation technology in this zone has already been transferred to the fishermen; there is also more usable water surface available, so it is believed that further development is possible. Since the initial investment per household is not large, they can acquire the necessary funds from the existing credit system, so this project will not include seaweed culture activities.

The cage cultivation joint extension project planned for Saleh Bay by the Provincial Fishery Office and the District Fishery Office is aimed at developing the effective use of the

bay's waters, which has lagged until now. Even so, since the initial investment and operating costs for cage culture are significant, and the existing credit system has very limited funds. Thus, it will be difficult for fishermen to enter this business. The cage culture extension is more than just rearing technology, but favorable results can not be achieved without funds and human management and technical skills. Since the government's cage culture extension project does not adequately include management and technology, other forms of support is required.

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

This zone covers the model sites of Soro and Hu'u in Dompu district. In Soro, there is one village-level fisheries cooperative (KUD Mina Uni) with 440 members. It was founded in 1967 and formally registered in 1991 with the Cooperative Office (Dinas Koperasi). The cooperative activities include are savings/credit; the sale of kerosene and diesel oil, and collection of electric utility bills. Its operation for FY2000 showed an income of about Rp 7.6 million, deposits of Rp 17 million (membership fee and compulsory savings). In addition, this village has eight fishermen kelompok and, six women kelompok as well as 144 fish traders. About 30 people participated in a workshop conducted in this village to explain the planned fisheries programme. As in the case of the Bima priority zone workshop, the participants were strongly opposed to entrusting the operation and management of the proposed project to the existing cooperative, due to the organization's non-transparent accounting practices, lack of administrative and technical skills. The participants also pointed out that in the past, the cooperative had failed to fulfill its responsibilities for lost or stolen boats.

In the other model site, Hu'u, a new cooperative (Koperasi Nelayan Mange Colu) was formed in 2002 and has applied for registration with the Cooperative Office. It was organized by the village head and about 200 fishermen have joined it. The members of the cooperative have shown a great deal of interest in the proposed project. It has planned a wide variety of activities, and it has founded subcommittees for each one. The cooperative has not started implementing any activities at present, but it is prepared to participate in planning activities for this project and to receive administrative guidance. There are no fishermen or women kelompok in Hu'u.

(2) Fisheries credit

In Soro, KUD Mina Uni provides credit for members who contribute in the savings fund. The cooperative provides small credits ranging from Rp 200,000 to Rp 500,000 with a repayment period of two months and monthly interest of 7 percent, which is relatively high for fishermen (an annual interest of 84%). It accepts daily repayments and follows up on the collection of repayments. It is quite well organized with four people in charge of credit and bookkeeping/accounting that is well kept. However, their economic activities such as sales of kerosene and diesel fuel and collection of electricity fees do not bring in significant returns, and the cooperative is unable to amass enough funds for investment. The cooperative's credit fund has been acquired mainly through returns on high-interest loans or deposits by its members (payment of regular membership fees and voluntary deposits).

The fishermen's cooperative at Hu'u has just been organized and has not begun any

financing activities, and the fishermen have been forced to rely on informal financing arrangements.

PEMP funds for small-scale fishermen are distributed to Dompu District as well. In 2001, the District was allotted Rp.800 million, but neither Soro nor Hu'u was chosen to receive financing that year. In addition to the PEMP funds, Dompu District is allotted financing for fisheries from the Dana Royalties Fund of the Newmont Mining Company which is located in Sumbawa Island. In 2001, the company has contributed RP 4.2 billion to the district, of which Rp.145 million are allocated to the fisheries division. This fund is administered by the district government. The District Fisheries Office receives applications, conducts the first screening before passing them on to the district government for secondary screening and final approval. The local development bank (BPD) handles the fund, and the District Fisheries Office handles the task of overseeing repayment. The three conditions for financing are 1) formation of a kelompok, 2) sufficient operating funds, and 3) sufficient collateral. The annual interest rate is 12 percent and the repayment period is determined by the amount of the loan.

1.3.2 Fisheries Extension, Education/Training

The district fisheries office (DFO) has six fisheries extension staff and 19 extension workers in the field. These 19 members are actually agricultural extension workers and assist in fisheries extension when they are called upon. The DFO plans activities and requests the necessary budget from the district government. In 2001, Dompu district had a fisheries development budget of about Rp 195 million, of which about 50 percent was for training and extension activities in pilot pond fish culture, resource conservation and institutional strengthening. A budget of about Rp 350 million was proposed for FY2002, of which 50 percent is earmarked for extension/training programmes. According to field extension workers, extension and training activities are conducted on ad hoc basis depending on budget allotments, and a long-term view is not considered. The workers also indicated that they could not cope or sufficiently assist the fishermen and farmers with problems raised by them because the education/training they had received is insufficient and also they had not been really exposed to field activities.

1.3.3 Community Living Environment

(1) Soro Site

The Soro fishing village is made up of a cluster of platform-style houses crowded together on a narrow coastal plain. Seventy-five percent of the households earn their living by fishing.

At the environmental improvement workshops that were carried out in this village, the following issues concerned with the community living environment were discussed.

Issues	Existing Conditions
1) Water Shortage	One of the problems with the community living environment is a lack of water for drinking and household use. There are shallow wells in the village, but because of the high salinity of the well water, they are not used very much. For drinking and household purposes, deep wells owned by some of the residents (14 places within the village) are used, and the users pay a monthly fee of Rp 2,500. The usage fee is not a significant financial burden, but since there are very few deep wells, each well is used by up to 70 households, and residents may have to wait a long time to use it. In addition, each household makes an average of six trips per day to the well.
2) Poor Wastewater Drainage and Outflow	The main roads within the village are paved, but wastewater drainage is poor, and almost all the residents are dissatisfied with the conditions. Wastewater drainage near the wells is also poor, and in some places, it accumulates and contributes to the stench.

3) Toilet Shortage	There is one public toilet in the village, but since it has no water supply, it gives off a strong stench and is not used. About 60 percent of the households have no toilets, and instead, people use the beach (where fish are landed) or the riverbank for this purpose.
4) Disorderly Garbage Disposal	Since there are no rules about trash disposal in the village, residents keep the area around their own house clean but throw garbage onto the beach. Since the discarded garbage is washed back in by the tides, it scatters and accumulates in the seaside areas where fish are landed.
5) Electricity and Cooking	Almost all households are supplied with electricity. Most households use brushwood as their cooking fuel.
6) High Primary School Dropout Rate	Parents tend to place a higher priority on their children helping with the fishing than on their attending school. As the children begin going out fishing during their primary school years, they gradually stop going to school and often drop out. (The dropout rate is said to be about 10%).
7) Lack of Leadership	Aside from working together to clean common facilities, the residents also cooperate on such occasions as weddings and funerals, so community activities do exist. However, even though the residents have long felt the need for shared purchasing of items that are used in common (for example, the many table, chairs, and utensils needed for a wedding), no one is willing to organize the endeavor, so the residents inevitably end up renting them. This is one indication of the lack of leadership.

(2) Hu'u Site

Hu'u fishing village is located on a road that branches off from the main road out of Dompu and heads toward Cempi Bay. It is about 500 meters away from the fish landing area, and is made up of a mixture of platform-style houses and houses built flush to the ground. Of the 550 households, about 75 percent are engaged in fishing, but of these, only about 15 percent (73 households) rely exclusively on fishing, and the majorities are also engaged in agriculture.

At the workshops on environmental improvements that were carried out in this village, the following issues concerned with the community living environment were discussed.

Issues	Existing Conditions
1) Water Supply	A water pipe passes through the village, but no more than 5 percent of households have paid the fee for running water at home (Rp. 400,000 to Rp.1,000,000). In addition, there are wells with good water quality. Households that have neither running water nor a well use this water source (Rp. 2500/month). Fifteen to twenty households use each running water connection or well. They do not have to wait long to use these sources, and the water supply is not a major issue in this village.
2) Village Roads and Wastewater	The road that leads from the main road to the village is paved halfway, but from there to the landing point on the beach, it is unpaved. Side streets in the village have poor drainage and become muddy when it rains.
3) Toilet Shortage	There are two public toilets in the village. Since they are not supplied with water, people bring water when they use them. The residents usually relieve themselves along the seashore or river. Since these places are far from the fish landing site, they do not affect the sanitary conditions of the fish landing site.
4) Disorderly Garbage Disposal	Since there are no rules about trash disposal in the village, residents keep the area around their own house clean but throw garbage onto the beach. Since the discarded garbage is washed back in by the tides, it lies scattered in the coastal areas where fish are landed.
5) Electricity and Cooking	Almost all the households are supplied with electricity 24 hours a day. Most of the households use brushwood as their cooking fuel.
6) High Primary School Dropout Rate	The expenses of commuting to school are a major burden. Parents tend to place a higher priority on their children helping with the fishing than on their attending school. As the children begin going out fishing during their primary school years, they gradually stop going to school and some drop out. (The dropout rate is said to be about 10%).
7) Lack of Leadership	The residents cooperate with one another on occasions such as weddings and funerals, but they do not cooperate in cleaning public facilities such as the roads or the mosque or other such activities. They also do not get together to purchase recreational items (such as balls and a net for volleyball).

1.4 Development Issues

- a) Distribute fishing activities that are presently concentrated in shallow coastal waters to water areas with abundant resources in order to cope with the increased local and export demand and to achieve a sustainable and stable increase in fish production volume (southern and northern coastal waters).
- b) Promote the development of mariculture as a supplementary source of income for small-scale fishermen and establish a sustainable fisheries resources management system for the inland waters (Saleh Bay).
- 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 develop small-scale fisheries and to establish a stable fish supply in the district by introducing coastal fisheries management, developing offshore fishing grounds, developing fisheries infrastructure, reduce post-harvest losses, create a fishermen association that reflects local conditions, and other measures in Soro and Hu'u, that have been categorized as independent fishing villages located near consumption sites in the master plan. 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 for the local fishing communities that will be categorized as independent fishing villages located near consumption sites.

2.2 Basic Development Concept

Of the fisheries in the Zone, the Soro fishery is similar to the one in Waworada Bay, in that it consists mainly of Bagan boats and purse seiners operating in Saleh Bay, while Hu'u fishery is predominantly purse seiner operations in Cempi Bay. Since these fisheries use extremely fine-mesh nets, which put intense pressure on the marine resources in the bay, this practice should be brought under control in the future in the interest of sustainable use of resources. In order to do this, it will be necessary to change the current modes of fishing and develop unused resources inside and outside the bay, or else raise the fishermen's incomes by eliminating economic losses (deterioration of fresh fish due to long landing operations and lack of ice, lack of competitiveness in processed goods due to underdeveloped processing technology) generated by the current fishery. Since it is a long distance from Soro to the mouth of Saleh Bay, it would be difficult to develop fishing areas outside the bay, so there will be need to improve the structure of the fishery with an eye toward increasing mariculture along the shoreline. Meanwhile, in Cempi Bay, developing the nearly untapped resources in the fishing grounds outside the bay must reduce the pressure on fishery in the bay. Furthermore, in order to promote coastal fisheries, it will be necessary to set important district regulations in place and improve the fishery administration system of the district government. Despite these measures, not only do the fishermen presently lack knowledge, capital, and organizational skills, but the systems, facilities, and equipment needed to support their activities are not sufficiently in place. As a result, they are locked into poor conditions in terms of production, distribution, and their community living environment.

Unlike the plan for Waworada, a plan for the following policy measures that will allow overall amelioration of the aforementioned issues has been formulated for Soro and Hu'u, which are independent fishing villages that do not seek ties with other villages and serve the role of supplying fish to markets in the district.

- 1) In order to encourage appropriate resources management by the fishermen themselves, given that their immediate offshore fishing rights are not systematized, the institution of an initial coastal resources management system that is feasible for both the fishermen and the regional government will be created. The aim is to raise the fishermen's consciousness about resources management and to promote improvements in the local governments' fishery systems. In particular, trial operations in mariculture and establishing boundaries for fisheries and marine culture zones, to effectively utilize the resources within Saleh Bay are recommended.
- 2) Fishery facilities connected with landing, shipping, distribution, and processing

should be provided, and fishermen and fishermen's wives should be given technical training and advice from extension officers, with the aim of raising their incomes. Note, however, that because of the limitations of Hu'u's natural conditions, landing facilities for that village has not been included.

- 3) Based on the degree of maturity of the activities of the existing sub-village fishermen cooperatives (Kempo) and fishing cooperatives (Hu'u), the project administration system will be centered on these organizations in a way that is beneficial for the fishermen. In addition, until the fishermen's organizations mature, the regional government and the regional cooperatives should set up mechanisms to assist them.
- 4) Programs that strengthen the motivation of the residents of the fishing villages to take the initiative in improving village infrastructures and social and living environments will be created.
- 5) Extension and training programs to extend the activities described above to other areas in the district will be implemented.

2.3 Sector Plan

2.3.1 Plan for Coastal Resources Management

This plan covers the waters of both Cempi Bay in the southern part of Dompu District, and Saleh Bay, which is split between Sumbawa District and Dompu District. In contrast to Cempi Bay, where gill net fishing, and angling as well as purse seine operations of large migratory fish are carried out, fishing in Saleh Bay is mainly for small pelagic fish using large Bagan boats and purse seiners.

According to sources from the District Fisheries Office, the existing resources of the northern coastal waters of the Flores Sea (the Dompu district waters) are estimated to be 13,775 tons for the whole district (in a water surface area of 2,763 km²). The NTB State Fisheries Office has estimated the natural resources per square area of water surface for each district and each marine area in the province. These results show 657 tons of resources for Cempi Bay (of which 585 tons is demersal fish), and 1,155 tons (of which 949 tons are demersal fish) for Saleh Bay (the Dompu District side). Yet the catch in 1999 was 3,009 tons for Cempi Bay and 20,515 tons for Saleh Bay, and the catch has remained stagnant for several years.

Since the fishermen around Cempi Bay operate not only within the bay but also in the coastal waters of the Indian Ocean, its natural resources are believed to be 71 percent developed, and the fishermen have hardly begun to exploit the resources in the offshore waters of the southern coast of neighboring Sumbawa. For this reason, the already used offshore fishing areas of southern Dompu based in Hu'u, especially those off the southern Sumbawa coastal waters, should be extended.

On the other hand, the coastal waters of the Flores Sea outside Saleh Bay are already being over fished, and within the bay in particular, the fish are getting smaller, therefore, immediate attention to resources management-based fishing is needed (see the table below).

Water Area	Estimate by Provincial Fisheries Office	Amount of catch	Percentage of resources developed	Remaining resources
Cempi Bay	657 tons	3,009 tons	71%	1,246 tons
Indian Ocean (Dompu District)	3,598 tons			
Indian Ocean (Sumbawa District)	23,314 tons	not used	nearly 0%	23,314 tons
Saleh Bay (Dompu District)	1,155 tons	3,026 tons	236%	none
Saleh Bay (Sumbawa District)	1,295 tons	17,489 tons		
Flores Sea (Sumbawa District)	8,085 tons	4,372 tons		
Flores Sea (Dombu District)	2,082 tons	503 tons	24%	1,579 tons

Source: NTB Provincial Fisheries Office, Dompu and Sumbawa District Fisheries Statistics, 1999.

Given the conditions described above, the fishing grounds along the southern coastal waters including Cempi Bay should be extended, in particular, developing and making use of the unused resources along the southern coast of Sumbawa District. If current trends continue in Saleh Bay, it is feared that the catch will either level off or decrease, and that the natural increase in the population of fishermen will lead to declining incomes. Therefore, it is vital for Soro, with its location at the far end of Saleh Bay, to extend its fishing grounds outside the bay (to such places as the waters of the Flores Sea off the Tambora Peninsula), as well as to engage in projects in seaweed culture and resource cultivation, in order to lay the groundwork for future income stability among the fishermen. Therefore, the following projects will be implemented to reflect these objectives.

A. Project to Improve the Data Collection System

Kempo has a branch office the District Fisheries Office with one employee assigned to it, so it is possible to collect data there, but Hu'u has no employees assigned to it, so once a month, the main office dispatches an employee to conduct a sampling survey of the catch. However, only the estimated data of the fish landing volume based on the number of fishing boats is collected, and there is no data about seasonal variations in fishing boat operating patterns or daily variations in the catch. As a result, the data for each water area is incomplete and inaccurate. Yet, given the limited budget for the data collection activities of the District Fisheries Office, it is extremely difficult under current conditions to gather data at greater frequencies or in greater detail. In addition, almost none of the fishermen write down their daily volume of landed or sold fish catch, so there are no statistics to work with, which are needed to establish sound fishing administration.

Due to these circumstances, it will be essential to construct and implement an accurate data collection system that uses the limited budget and personnel more efficiently. A specific method might be to have currently working fishermen write down a record of their daily operations and to make use of that data. At the same time, this would raise each fishermen household's awareness of management practices. Note, however, that in order to promote these actions, it would be necessary to increase the fishermen's willingness to keep records by instituting incentives such as preferential terms for credit. Incidentally, as part of this survey, a pilot project was conducted in which 20 local fishermen from Soro and Hu'u kept their own operating records. Even though there were individual differences among the contents of the records, almost all participants completed the record keeping project, including the owners of non-motorized fishing boats. In the future, record keeping format may need to be revised for different fishing methods, but it was found that the fishermen had the ability to keep their own records. Among the fishermen in the trial, some kept separate daily records themselves (or had a family member do it). Even illiterate fishermen can ask family members or relatives to fill in the forms. Furthermore, if this activity becomes standard practice, each fishermen household may come to realize the importance of education,

and this, in turn, might contribute to a decrease in the school dropout rate among local children.

The specific plan of action for this project to improve the data collection system is as follows.

(1) Range of the Plan and Scope of the Activity

There are many non-motorized fishing boats in this zone, and gathering data on all of them will be difficult, in view of the scope of the activity. Therefore, the initial focus will be on the motorized fishing boats that are believed to use the model sites and those fishermen who are willing to cooperate with the project. Other fishermen will be able to join voluntarily at any time based on the benefits that are produced by the project.

Model site	Number of fishermen households at the site	No. of fishing boats included (Initially)	Breakdown
Soro	1,101	60	33 Bagans, 10 purse seiners, 14 gill netters, 3 other
Hu'u	73	30	14 purse seiners, 3 gill netters, 6 line fishing boats, 7 others
Total	1,174	90	

Note: "Others" refers to the number of candidates in the sample of non-motorized boats

(2) Nature of the Activities

The following activities in Soro and Hu'u will be implemented.

	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 DFO officer 2 Data collectors	5 days
2	Distribute the format of the records and explain the recording method (Fishermen will gather at each village and a seminar will be held. After an overall explanation has been given, the fishing operation of each individual will be checked, and the recording method will be explained accordingly).	1 DFO officer 2 Data collectors	5 days
3	One-month trial record keeping task (make 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 fisherman, and answer questions, provide guidance).	1 DFO officer 2 Data collectors	5 days
5	Evaluate content of the records, analyze data (DOF officer will supervise the analysis method and procedure for 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. Ball point 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 to be checked and stamped. The data will be input into a PC and sent to the provincial DOF office once a month).	3 Data collectors	180 days (15 days/month x 12 months)
8	Guidance to improve fishing operations of fishermen 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 that they face).	2 DFO officers	20 days (5 days, 4 times a year)

B. Project to Expand the Fishing License System

The fishing boat licensing system in this zone is not very carefully or thoroughly implemented. Data on the number of fishing boats is revised every year based on the results of a counting survey held at the rate of once every 5 years, but with fishing villages in scattered locations and transportation for the survey personnel is inadequate, so it is

impossible to carry out a sufficiently accurate survey of the number of vessels. When it comes to granting licenses for coastal small-scale fishing, collecting license fees, and issuing permits for building fishing boats, these procedures are either not systematized or fully in place. Furthermore, since there is no registration number or home port displayed on the boat itself, it is impossible to figure out or confirm which boats are unregistered. Non-motorized canoes do not need to be registered, but motorized fishing boats need to be marked with a flag, an inscription on the body of the boat, or some sort of fishing boat marking. A list of motorized fishing boats was compiled during this survey, but since a counting survey of landing areas was also conducted for a month, information on all the fishing boats could not be obtained.

Given the circumstances described above, this project will implement the following activities on a trial basis at each model site. Based on the results, the existing fishing boat licensing system will be developed and disseminated on a district-wide level.

	Activity	Person-in-Charge	Period
1	Update 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 data based will be revised.)	3 data collectors	30 days
2	Formulate a licensing system for boat construction (formulate and implement licensing systems for fishing boats and for building new boats at the model sites on a trial basis. Notify the residents of the fishing villages of the implementation of the system and hold hearings.)	1 DFO officer 1 Provincial officer	30 days preparation, 30 days licensing period, 5 days for public hearing
3	Issuance of licenses and collection of fees	1 District officer	30 days
4	Boat markings (based on the list of renewed licenses, flags for marking the fishing boats will be prepared and distributed to each registered boat. The flags will indicate the boat's port of registry and fishing method. For fishing boats from other districts that operate in the area, seasonal licenses will be issued.)	1 DFO officer 3 data collectors	30 days
5	Monitoring of the model sites and reevaluation of the details of the system	1 DFO officer 1 Provincial officer 3 data collectors	3 months
6	Formal institution of the system, develop it and extend it to the entire district	1 DFO officer 2 data collectors	12 months

C. Project to Expand Fishing Grounds

As explained previously, Soro (Saleh Bay) has been over fished, mainly by Bagan boats. Fish have been landed in numbers that clearly outstrip the capacity of the bay's potential resources, and the catch is stagnant. On the other hand, Hu'u (Cempi Bay) carries out fishing on a relatively small scale, so despite the existence of unexploited resources in the southern coastal waters, it is currently impossible to extend the fishing grounds further. Fishing grounds must be developed and extended at both sites, and resource management-based fishing must be promoted in the bays.

C-1 Developing Offshore Fishing Grounds

At present, neither Soro nor Hu'u fishermen use fish aggregating devices (FADs) at all. Since Saleh Bay already tends to be over fished, raising the efficiency of the catch by installing FADs in the bay should be avoided. In addition, moving from Soro to the open sea requires a journey of at least 40 miles, the fishermen of Soro would be unable to manage any

FADs that were installed offshore. On the other hand, the fishermen of Hu'u are already fishing in the coastal waters outside Cempi Bay using purse seines and hooks and lines, and it is easy for them to find schools of fish without relying on FADs (there is a high density of available resources). It is also possible to install FADs in deep sea waters of 1,000 meters or more, but given the usually high waves, it would be difficult for existing fishing boats to approach them. Based on the above, FADs will not be installed in these waters to expand the fishing grounds.

C-2 Construction of Places for Seaweed Cultivation

Saleh Bay is a breeding and spawning ground for useful varieties of fish and shellfish, but large numbers of both pelagic and demersal fish fry have been caught by Bagan fishermen using fish lamps. In order to provide a supplementary income for fisherman households, measures must be taken to reduce overfishing by Bagan fishermen. In addition, the tidal waters inside the bay have not been put to any effective use. In the vicinity of Soro are a few plantings of mangroves, and the presence of natural beds of oysters and other shellfish has been confirmed, but these resources are not being used.

Furthermore, the number of breeding grounds for useful fish and shellfish (mangroves, seaweed marshes, rocky areas) has decreased along with the increase in the human population, and this is believed to be one reason for the stagnant catch in recent years. In order to achieve sustainable fishing in the bay, it will be necessary to preserve and replant coastal mangrove areas, and create artificial reefs and appropriate management of seaweed marshes and rocky areas as soon as possible.

Based on the above, in order to develop additional mariculture technology that can be implemented by the local residents themselves, the following trial culture activities will be conducted in the Soro area of Saleh Bay.

(a) Cultivating Shellfish with Artificial Rocks

Rocks and concrete piles will be placed in tidal areas to serve as natural breeding grounds for oysters and other edible shellfish. The shellfish that adhere to these structures will be culled by the community in appropriate numbers and sold. The size of the experimental waters will be 1 hectare (100m x 100m) and about 100 rocks and concrete piles will be installed at intervals of about 10m.

(b) Trial Transplanting of Mangroves

Seedlings from the mangrove forests will be harvested around the coast of the bay, and raised and transplanted in the tidal flats around Soro. The size of the replanted area will be about 3 hectares (100m x 300m).

(c) Trial Construction of Seaweed Marshes

There is no information or data whatsoever on the seaweed marshes currently existing in Saleh Bay. Therefore, in order to first survey what kinds of seaweeds and sea grasses can take root and grow in the area, carbon fibre ropes (2 ropes of 10 m each in 1 locations) and concrete panels (silica added, 2m x 2m x 200 mm thick, 2 panels in 2 locations) will be lowered into the water area. These materials allow seaweeds and sea grasses to take root. Over a period of two years, these installations will be checked every three months to monitor the conditions and gather data on the types of plants that have taken root.

Simultaneously, trial activities to transplant eelgrass from the Eastern Lombok District will be carried out. Ten 50-cm square eelgrass mattresses will be buried in the ocean floor about 1 or 2 meters deeper than the lowest tide levels. Over two years, their growth will be monitored every six months and data will be collected.

(d) **Trial Introduction of Useful Seaweeds**

Culture experiments will be conducted on useful seaweeds for which a certain amount of cultivation technology already exists, such as Ceylon moss and *Nemacystus*. The seedlings will be grown at the Lombok Cultivation Station, and after they have been transplanted, ropes and cords will be installed in the waters along the Soro coast. At present, efforts are being made to find a cultivation area to create seaweed marshes.

C-3 Larger, Modernized Fishing Boats (introduction of model boats)

Except for the Bagan boats used in Saleh Bay, most of the catch in both areas is landed by purse seiners. However, the existing purse seiners are small, only 8 to 12 meters long and carry 8 to 10 persons. They are non-motorized and are not equipped with insulated fish holds. In addition, the high waves in the open sea make it unsafe for the boats to venture outside the bays on fishing trips several days in length. For this reason, the fishermen go out only one day at a time, which inevitably limits the fishing areas. It is essential for the fishermen to have larger, more modern boats if they are to extend into previously unexploited offshore waters.

This project has the same objective as the one in Waworada: model boats of the same type will be introduced to both sites in an attempt to develop fishing grounds along the south coast of Sumbawa (Indian Ocean side) to the northern coast of the Tambora Peninsula (Flores Sea side). At the same time, local fishermen (particularly the younger fishermen) will receive training through three-day trial fishing operations using the model fishing boat provided in this project (see section 2.3.1 C2 "Large, Modernized Fishing Boats" in the V-1 Bima Priority Zone report).

C-4 Motorization of Fishing Boats

About 40% of the fishing boats in these waters are motorized, and looking at the survey area as a whole, motorization is relatively advanced. In addition, most of the non-motorized fishing boats are quite profitable concerns that catch demersal fish with hand lines. This fishing boat motorization project (micro credit) is limited to no more than a small number of boats, but it has already been implemented by governments, cooperatives, and NGOs. It is believed that the efficient use of existing credit (revolving funds) will gradually promote motorization. Therefore, this project will not include motorization of fishing boats at either Soro or Hu'u.

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

Blast fishing for demersal fish has often been observed in Saleh Bay. Although there are no such reports, it is assumed that this destructive fishing method is also used along the southern coast of Sumbawa, which has almost no villages. Long line fishing boats from Java or Bali hunting tuna or lobster sometimes operates in the coastal waters, but it is impossible to identify which boats they are. Once the previously described registration and marking system for fishing boats is in place, and it becomes easy to recognize unregistered fishing boats and those from other regions, it is hoped that enhancement of the eyewitness reporting and control system will prove effective in controlling illegal fishing boats.

D-1 Develop a Marine 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 offices much

later after they return to port. Therefore, a marine wireless communications network will be established to enable fishermen to immediately report any illegal fishing vessels that are observed during their fishing operations. In addition, such a network can serve as a communications link during such emergencies as shipwrecks. Note that since there are no plans to install FADs at either site, duty rosters will be determined separately for each of the fishing grounds. They will be asked to carry wireless communication devices and form part of a communications system. The waters that they will be asked to patrol will essentially be limited to those used by the fishermen of Soro and Hu'u. (up to 20 miles from the land-based stations.)

Model site	Uses	Communications devices	Number
Soro	For land station	VHF wireless, tabletop model, 25 W	1 set
	For coastal patrol	VHF wireless, portable, 5 W	3 sets
Hu'u	For land station	VHF wireless, tabletop model, 25 W	1 set
	For coastal patrol	VHF wireless, portable, 5 W	3 sets

D-2 Mobilization and Control during Emergencies

A high-speed vessel of the same type as in the Waworada project and with the same objectives will be provided for each site (see Chapter V-1 Priority Zone Bima 2.3.1.-D3 "Mobilization and Control during Emergencies").

2.3.2 Plan for Fish Landing, Handling, Marketing, and Processing

(I) Number of Targeted Fishing Boats and Handling Volume

The objective of this project is to provide a stable supply of popularly consumed fresh fish species to markets in Bima and Dompu 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 amount 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 may be included in the future. The average number of fishing boats in port per day (peak hours) during the peak fishing season for each site and fish landing volume has been estimated and are shown in the table below.

(a) Soro (peak fishing period, July-August)

Type of fishing boat	Fish landing		Average no. of vessels/day	Average fish landing volume		
	Time period	Hours		vessels in port	Average fish landing volume	
			Vessels/day	Vessels/hour	Tons/day	Tons/hour
Bagan	04:00-07:00	3	31.3	10.4	2.61	0.87
Purse seiners	04:00-07:00	3	10.0	3.3	0.83	0.28
Gill netters, lines	unspecified	6	10.1	1.7	1.51	0.25
Fish collection boats	02:00-07:00	5	40.0	8.0	17.22	3.44
Total	-	10	91.4	9.1	22.17	2.22
Peak time total	04:00-07:00	3	65.3	21.8	13.77	4.59

(b) Hu'u (peak fishing period, May-June)

Type of fishing boat	Fish landing		Average no. of vessels in port		Average fish landing volume	
	Time period	Hours	Vessels/day	Vessels/hour	Tons/day	Tons/hour
Purse seiners	12:00-15:00	3	12.0	4.0	2.63	0.88
Gill netters	06:00-12:00	6	3.0	0.5	0.30	0.05
Long line, hook and line	06:00-12:00	6	6.0	1.0	0.21	0.04
Total	-	9	21.0	2.3	3.14	0.35
Peak hours total	17:00-20:00	3	12.0	4.0	2.63	0.88

See Appendix 1, Table 1-10.

2) Utilization Plan for the Catch

Estimates of the amount landed at each target site, determined according to the procedures shown in Appendix 1, are as follows (for details, see Appendix: Table 1-11).

		Current Situation			Improvement plan		
		Fresh fish	Unsold fresh fish	Processed	Fresh fish	Processed (existing products)	Processed (new products)
Soro	Used (tons)	1,683	378	1,423	1,989	1,286	208
	Percentage	48%	11%	41%	57%	37%	6%
Hu'u	Used (tons)	605	138	567	689	424	197
	Percentage	46%	11%	43%	53%	32%	15%
Total for Dompu Zone		2,288	516	1,990	2,678	1,710	405
		48%	11%	41%	56%	36%	8%

At present, 59 percent of the fish catch is distributed as fresh fish, but due to daily fluctuations in the catch during peak seasons, it is believed that about 11 percent (about 19 percent of fresh fish) remains unsold. It is possible to store leftover fresh fish in ice and sell them the next day, but the fishing methods and fishing seasons in the landing areas for the waters that supply the Dompu and Bima markets are nearly the same, and in the consumption areas west of Dompu (Sumbawa Besar, Mataram, and Denpasar) the markets are overflowing with fresh fish at these times of year. In this zone, therefore, measures will be taken to stabilize the amount of fresh fish supplied to consumers in the district, including the Bima markets. In addition, since the leftover fresh fish are mainly sardines, round scad, and frigate tuna, fish that are sold at low prices. These fish will be used to produce new processed products for markets outside the district. Measures to raise the selling price of existing processed products by improving their quality will also be introduced.

Measures to adjust the daily fluctuations in the amount of fish landed will include not only storage of fresh fish in ice, but also production adjustments by the fishermen, as far as possible, both of which will lead to more stable shipping of the catch and fish prices. In particular, purse seiners operate during the day and they are not affected by the full moon. Since they catch mostly large pelagic fish, their operations can be concentrated during this time, when the Bagan boats in Soro do not operate. This would control the fluctuations in the amounts shipped.

(2) Review of the Project Components

A. Fish Landing and Handling Improvement Project

In Soro, the catch is landed mainly by fish collection boats on the beach, but because of a large, three meter disparity between high and low tide in the shoals, and, the seabed is

exposed as far as 300 to 400 meters at ebb tide. For this reason, landing the catch requires people to carry 30kg plastic containers across the mud flats, a task that requires a large labor force and a great deal of time. Furthermore, since almost all the catch is landed before dawn, working conditions are dangerous, requiring the laborers to walk across the flats carrying lamps. At high tide, the fish traders can let the boats dock at their own houses, but once the catch has been landed, they need to move their boats offshore in preparation for the next days embarkation. The same is true for the fishing boats. Even though the Bagan boats and purse seiners sell the majority of their catch to fish collection boats at sea, these factors affect both the final fish catch and the preparations for the next day's fishing operation.

The planned site for Soro is at the currently derelict existing PPI (public fish landing facility) located about 1km from the village. Since this site is in the inner bay and shielded by a peninsula, it is almost never affected by surges at any time of the year. Although there are shoals and tidal flats for a distance of about 300 meters from the coastline, there is a steep drop-off beyond. The existing PPI could be put to use. For these and other reasons, the district government, the local fishermen, and the fish collectors selected this site after careful consultations. It would also be conceivable to build a new facility in front of the existing settlement, but this would involve higher construction costs, and it would also be inappropriate for one village to have two such facilities.

After the fish is landed, it is sold from the houses of fish collectors to fish traders and retailers, and the price decided through negotiations. Because they get hold of the catch earlier, landing inevitably ends up being within the purview of the fish collectors, and the retailers almost never walk through the muddy beach. Therefore, if the new facility is easy for the fish collectors to use and makes the task of unloading the fish easier, the fish traders and retailers from Dompu who come to purchase the fish by car will remove distance from the village. Even for the local fish traders and retailers, the distance of the new facility from the village is not much different from the distance they have to walk to stock their shops, since the village itself is about a kilometer in length.

Based on the circumstances described above, the pier at the existing PPI in Soro will be extended about 100 meters, and the fish catch will be landed, unloaded, and handled about 200 meters out in the open water.

Note that since Hu'u lands a relatively small amount of fish and is used by relatively few fishing boats, and since it is significantly affected by swells from the Sau Sea, it is expected that building a quay wall for landing would be very costly. A cost-benefit analysis suggests that this is not the right time for providing a landing facility in Hu'u, therefore, only land-based facilities will be provided at this time.

A-1 Improvement of the Landing and Handling at Soro

(a) Improving the Landing Wharf Facilities

As explained above, a pier will be constructed to enable fishing boats to directly moor at the pier and land their catch. After the boats have been moored, the catch will be carried to the sorting area behind the pier in plastic containers¹.

After the fish have been sold, the fishermen will be able to refuel their boats and restock their supplies for their fishing operations the next day after their catch has been landed and sold before moving their boats away from the jetty. Few fishing boats land their catch directly on land, and in addition, the crew members often divide the remaining fish

¹The cargo boat operators will continue to use the containers they currently own (cylindrical with a capacity of 30L).

among themselves and take it home. Therefore, although they will not land their catch at the planned facility, they will be able to make their preparations for the next day's fishing operation at the planned facility. Based on the above, the mooring time for each boat, for replenishing fuel and supplies, will be about 45 minutes. The size of the loading wharf was calculated as follows.

(a-1) Landing Wharf

The landing facilities will be extended enough to accommodate the boats moored there at peak times. The model boat (15GT) will use the pier not only for landing but also for preparation and resting, and it will have a designated berth that will be its normal mooring place.

Using the procedures in Appendix 4, the required extension for the landing wharf and the wharf for the model boats, as well as the available water depth was calculated as shown in the figures in the table below:

Extension of the Landing Wharf

Type of fishing boat	Landing time	Average no. boats in port/day	Average mooring time	Average boat length (m)	Average berth length (m)	Required no. of berths	Required extension (m)	Required water depth (m)
Purse seiners	3	38.7	30	14	16.1	2	35	-2
Fish collection boats	5	40.0	45	9	10.4	6	65	-2
Model boat	-	1	-	16	18.4	1	20	-3

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, fish landing and preparation berth for fishing boats will be a -2m wharf (L=100m); and the berth for the model fishing boat will be a -3m wharf (L=20m).

(a-2) Plastic Containers

The average amount handled every 60 minutes during peak landing times is 4,590kg ÷ 50kg/box ÷ 30 times/hour = 3 units.

(b) Improving the Fish Handling Facilities

After being washed, the catch brought into the fish handling facility will be sold in small lots at a price negotiated with fish traders and retailers. Initially, fish transactions will be carried out in units based on the conventional containers, but since the use of kilograms is expected to become widespread among both buyers and sellers, hanging scales will be provided for use in fish catch transactions.

The hanging 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 fish traders, washed, and packed in ice for shipment, refrigeration, and processing.²

² 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 continue to be used.

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

(b-1) Fish Handling Shed

The fish handling shed will be set up to support a seamless work process from landing the catch to shipping. Based on the procedure shown in Appendix 4, the required floor place for each work area was estimated, and the sorting area will be equipped with the following facilities according to the following scale.

Contents and Size of Fish Sales Facilities		
Facility	Nature of the work	Required floor space
Selling and sorting hall	The catch is sorted and sold	260m ²
Secondary facility	Machine storage room, office, auction room	80m ²
Temporary storage for insulated crates	Cold storage, cool box for shipping	30m ²
Packing area	Preparation and packing in ice for shipping	130m ²
Storage space for insulated boxes	For overnight storage	20m ³
Loading of fish for shipping	Loading onto transport trucks	120m ²
Preliminary processing	Sale, washing, and preprocessing of fish for processing plants	340m ²
Total		980m ²

Note: See Appendix 4: Table 4-13, Sales Facilities

(b-2) Hanging Scale

The average amount handled every 60 minutes during peak landing times is $4,590\text{kg} \div 50\text{kg/box} \div 30 \text{ times/hour} = 3 \text{ units}$.

A-2 Improvement of the Landing Process at Hu'u

At Hu'u, the catch will be landed as before, brought directly to the beach landing area in hand-paddled canoes.

(a) Improving Fish Handling Facilities

Once landed on the beach, the catch is transported to the fish handling shed in plastic containers. After being washed, it is traded and sold to the waiting fish traders and retailers at a mutually agreeable price. Initially, transactions with the catch will be carried out in units based on the number of individual fish, but since the use of kilograms is expected to become widespread among both buyers and sellers, hanging scales will be installed, and people will be able to use them during fish transactions. 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 transactions, the fish will be transferred to the containers prepared by the retailers and fish traders, washed, and packed in ice for shipment, refrigeration, and processing.³ The fish handling shed will also be used in the preliminary preparations of dried and salted fish (scaling, gutting, filleting, and washing) and the area of work space and equipment needed is shown below.

(a-1) Fish Handling Shed

The fish handling shed will be set up to support a seamless work process from landing the catch to shipping. Based on the procedure shown in Appendix 4, the required floor place has been estimated for each work area. The sorting area will be equipped with the following facilities according to the following scale (For details refer Appendix 4: Table

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 continue to be used.

4.1.3).

Contents and Size of Fish Sales Facilities		
Facility	Nature of the work	Required floor space
Selling and sorting hall	The catch is sorted and sold	260m ²
Secondary facility	Machine storage room, office, auction room	80m ²
Temporary storage for insulated crates	Cold storage, cool box for shipping	30m ²
Packing area	Preparation and packing in ice for shipping	130m ²
Storage space for insulated boxes	For overnight storage	20m ³
Loading of fish for shipping	Loading onto transport trucks	120m ²
Preliminary processing	Sale, washing, and preprocessing of fish for processing plants	340m ²
Total		980m ²

Note: See Appendix 4: Table 4-13, Sales Facilities

(a-2) Hanging Scale

The average amount handled every 60 minutes during peak landing times is $880\text{kg} \div 50\text{kg/box} \div 30 \text{ times/hour} = 1 \text{ unit}$.

B. Project to Improve Fresh Fish Shipping

Since both the Bagan boats and purse seiners at Soro operate at night, almost the entire catch is landed in the early morning hours, while the purse seiners at Hu'u operate during the day, so the peak is in the evening. Not only is Soro's landing period early in the morning—it is only 30 minutes from the Dompur market, and some of the fish traders and retailers take the fresh fish they have acquired and pack 10kg of fish in 3kg of ice for transport. Kempo (Soro village) is able to supply about 2,500kg of ice per day (70 small freezers x 1.5kg/bag x 25 bags/freezer), but this is not enough for the peak fishing season. The price of ice is the same in both Kempo and Dompur market, Rp. 500 per bag (Rp. 330/kg).

On the other hand, in Hu'u the catch is landed at night, so it cannot be shipped to the Dompur market on the same day. The amount of ice that can be supplied locally is only an estimated 200kg/day (6 small freezers x 1.5kg/bag x 25 bags/freezer, same price as Soro), so the majority of the catch is salt broiled (pindang selepi) overnight and sold the next day. Comparisons between shipments of fresh fish and salt broiled fish (as of July 2001) are shown below.

	Salt-broiled fish (15kg produced and sold)	Fresh fish (15kg sold)
Cost	Fresh fish: Rp.500/each x 4 fish/kg x 15kg = Rp.30,000 Wrappers (palm bark): Rp.500/sheet x 60 sheets = Rp.30,000 Salt: Rp.300/kg 10kg = Rp.3,000 Fuel (brushwood): Rp.5,000 Transport: Rp.2,500/20kg Total costs: Rp.70,500	Fresh fish: Rp.30,000 Ice: Rp.330/kg x 30% x 15kg = Rp.1,500 Transport costs; Rp.2,500/20kg Total costs: Rp.34,000
Sales	Rp.2,500/fish x 4fish/kg x 15kg = Rp.150,000	Rp.5,000/4fish(kg) x 15kg = Rp.75,000
Profit	Rp.79,500	Rp.41,000

Based on the above, salt broiling is currently more profitable. However, the process is tedious, and since each woman processes 500-600 fish (even up to 1,000 fish) per night, these workers have almost no time to sleep.

Except for 4 fish collectors in Soro who collect demersal fish for export, insulated boxes for storage and shipping have not spread to either Hu'u or Soro.

This project will manufacture and sell sufficient ice and spread the use of insulated boxes in Soro and Hu'u so as to enable 250 tons of fish per month (an amount equal to about

40 percent of the catch during the peak fishing season of May to August) to be shipped steadily to Dompu market from March to December. The amount of ice and insulated boxes required are shown below.

(a) Provision of Ice Making Equipment and Storage Facilities

Based on the monthly plan on the use of the fish catch at the models sites, shown in Appendix 1, Table 1-11, the volume of ice needed for the daily average fish landing volume according to processing mode and the amount of ice during the peak fishing season are estimated as follows.

Model site (Peak fishing season)	Amount landed (tons/day)	Processing mode	Amount used (tons/day)	Ratio of ice (%)	Amount of ice required	
Soro July-Aug.	22.17	For fresh fish	for sale the same day	8.57	25%	2.14
			for overnight storage	0.30	75%	0.23
			For processing	13.30	10%	1.33
			Total	22.17		3.70
Hu'u (May-June)	3.14	For fresh fish	for sale the same day	0.20	25%	0.05
			for overnight storage	1.05	75%	0.79
			For processing	1.88	10%	0.19
			Total	3.14		1.03
Zone statistics					4.73	

1. It is estimated that half the catch is stored overnight, since it can be shipped out of the area during the night.
2. The volume of fresh fish transported out of the area was estimated using the ratio of the fish catch (Appendix 1: Table 1-11) distributed outside the area against the peak fish catch volume
3. The ratio of ice used for each processing mode is estimated from the results of Appendix 3: Freshness Tests.

Both the model sites are supplied with electricity 24 hours a day, and there is no problem acquiring supplies of pure water. Therefore, ice making equipment will be installed at both sites. Based on the table shown above, the equipment at Soro will produce 3.5 tons per day, and the equipment at Hu'u will produce 1 ton per day. Note, that since Soro is already capable of producing 2,500 kg of ice with small, household freezers, so if the ice making equipment described above is installed, it will be necessary to investigate other possible uses for the small freezers and for the ice that is produced.

The annual real availability factors for the sites are set based on the ratio of the maximum value of the catch by month to the average value of the catch.

Soro: about 225 days (average of 290 tons/month ÷ 471 tons/month in the peak season x 365 days)

Hu'u: about 245 days (average of 109 tons/month ÷ 153 tons/month in the peak season x 365 days).

In addition, since the maximum daily fluctuations in the catch are about twice the average value, the sites should have 2 days worth of ice in storage (7 tons for Soro, 2 tons for Hu'u).

Since small-scale fish traders and retailers will be the main customers for ice, the current practice will be continued and it will sold in plastic bags.

(b) Insulated Boxes and Creating a Storage Area

Fresh fish will be stored in ice in insulated boxes. The size and number of the insulated boxes will be reviewed according to the following two criteria.

- Fresh fish transport and sales by fish traders and retailers (calculated according to capacity and maximum number of people)

- Mandatory overnight storage of fresh fish (50% of the fresh fish volume of fish landed in the evening)⁴

Based on the volume of fresh fish handled per day by fish traders and retailers during the peak fishing season and the volume of fresh fish stored overnight, the required number of insulated boxes were calculated as shown below (see Appendix 1: Table 1-5).

(i) Soro

Users	Volume of fresh fish stored	Number of people	Number of insulated boxes by size (fresh fish storage capacity)			
			45L (30kg)	80L (50kg)	150L (100kg)	300L (150kg)
Fish traders	Under 50kg	95 people	95	-	-	-
	50-100kg	34 people	68	-	-	-
Retailers	100-200kg	11 people	-	23	-	-
	More than 200kg	4 people	-	-	7	-
Overnight	300kg	Gill netters line fishing boats	-	5	-	-

(ii) Hu'u

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)
Fish traders	Under 50kg	21 people	21	-	-	-
	50-100kg	6 people	12	-	-	-
Retailers						
Overnight	525kg	Purse seiners	-	-	-	4

At both sites, the fresh fish that is landed in the early morning is transported to city markets in the early morning, so no storage area for insulated boxes is required. In contrast, fresh fish that is landed in the evening must be stored by each local broker, vendor, or fisherman for shipment the next morning. At Soro a storage space for insulated boxes will be created. Since there are large-scale fish traders (those who handle more than 200kg per day) involved, storage space must be guaranteed for insulated fish boxes. Based on the information above, the following space will be created at each site to store fish boxes.

Model site	Soro	Hu'u
No. of insulated boxes installed	80L x 5 boxes (for overnight use) 150L x 7 boxes (for large-scale fish trader)	300L x 4 boxes (for overnight use)

(c) Provision of Communications Equipment

Telephone and communications networks are nearly nonexistent in either Soro or Hu'u, and the only means of communication in the district is at the Kantor Camat (sub-district administrative office) where an SSB wireless unit has been installed. This has impeded both the activities of the district fisheries office and responses in emergency situations and data on fish market conditions have been difficult to obtain. At present, 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 both Soro and Hu'u as part of this project. In addition, one SSB wireless unit will also be installed at the District Fisheries Office in Dompu. This wireless communications network will support and help effective

⁴ It is assumed that 50% of the fresh fish in the nighttime catch are will be stored in insulated boxes by local fish traders and retailers.

implementation of the coastal resources management plan explained above.

C. Project for Disseminating Fresh Fish Handling Technology

The catches from Soro and Hu'u are shipped to the Dompou market, and both sites are less than an hour away from the market by motorized vehicle. In particular, fish is transported from Soro at dawn every day when the temperatures are the lowest, and the trip takes only 30 minutes. The use of ice has already spread to Soro, but insulated storage boxes are not in use. With insulated boxes, it is possible to transport a greater volume, but lifting and loading the boxes on the truck is easier, and above all, the effects of using ice increase dramatically (see Appendix 3-1: Results of Freshness Tests). Although it is only a short distance to the market and ice can be bought at Dompou market, most of the fish traders and retailers put ice into the fish containers to transport their fish. Many retailers add even more ice at the market. This shows that these retailers are highly aware of the importance of preserving freshness, and the use of insulated boxes is anticipated spread quite easily.

On the other hand, the absolute amount of ice available in Hu'u is insufficient, and there is no way to acquire it. Most of the local fish traders and retailers add ice after arriving at Dompou market. However, they know that the fish traders and retailers at Soro add ice at the landing site before shipping, and their awareness about fish freshness is as high as it is in Soro. In particular, since the majority of the fish catch is landed at night, ice and insulated boxes are essential for storing fresh fish. Their use is anticipated to spread quickly.

It will be difficult to convince retailers and fish traders to use insulated boxes for same-day fish sales and transport over short distances, unless there is some positive benefit in terms of transport and load handling. In order to make small retailers who handle less than 100kg of fish per day to use insulated boxes, it will be necessary for them to experience the merits of cold storage, the ease of transport, and prolonged fish freshness.

Therefore, to promote the use of insulated boxes, workshops with 15 attendees each for local fish traders and retailers will be held. Each workshop will run for two days and will be carried out according to procedures similar to those planned for the Bima Priority Zone. (For details, see Chapter V-1 Priority Zone Bima: 2.3.2C: "Project for Disseminating Fresh Fish Handling Technology.")

A total of 171 persons in Soro and Hu'u will be the target audience for the workshops. Fifteen persons will attend each of the meetings, which will be held 12 times per year.

D. Project to Improve Fish Processing

At present, fish is processed in the yard of each fisherman household. Due to the lack of a cutting table and clean water, the work is carried out in very poor sanitary conditions—the flies and stench are rampant. In the salt broiling process in Hu'u, the fish is cooked directly on top of firewood laid on the ground since there is no boiler, and there is the constant danger of 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 9.2 tons per day in Soro and about 2.4 tons in Hu'u during the peak fishing season. The aim of the project is to improve and promote the quality of the 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 Table 1-11, Appendix 1).

The content of this project will be identical to the project that will be implemented in

the Bima priority zone (see Chapter V-1 Priority Zone Bima: 2.3.2D: "Project for Disseminating Fresh Fish Handling Technology").

In order to improve and develop a variety of products, this project will install a model processing plant inside the planned facility.

(a) Volume of Fish to be processed

(a-1) Soro

	Type of Processing	Fish Species	Ratio	Volume to be Processed
Existing product to be improved	Salt broiled, dried	Sardines, ponyfish, round	100%	9.2 tons/day
	sardines, soaked and dried	scad		
New products to be developed and promoted	Fish balls	Sardines, round scad	50%	1.0 ton/day
	Overnight drying	Sardines, round scad	50%	1.0 ton/day

(a-2) Hu'u

	Type of Processing	Fish Species	Ratio	Volume to be Processed
Existing product to be improved	Salt broiled	Bonito, frigate tuna	60%	1.5 tons/day
	Salt-dried, dried	Round scads, sardines, big-eyed scads	40%	0.9 tons/day
New product development and promotion	Half-dried bonito	Bonito, frigate tuna	45%	0.7 tons/day
	Fish balls	Round scads, frigate tuna	40%	0.6 tons/day
	Overnight drying	Round scads	15%	0.2 tons/day

(b) Size of the Model Processing Facility

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

In Soro, 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. In Hu'u, salt broiling is carried out at night using the fish that is landed by purse seiners in the evening. As explained previously, the cutting and cooking part of the process is done outdoors in the yard of fishermen households in unsanitary conditions, and there is also the danger of fire. Therefore, the entire processing process, with the exception of the drying process, will be carried out at the model processing facility. The content and size of the facility have been estimated as follows.

(b-1-1) Broiler

(i) Soro

Steaming: volume of 9.2 tons/day $1/3 \div (20\text{kg/frequency/minutes} \times 20 \text{ times/hours} \times 3 \text{ hours/day}) = 3 \text{ units}$

(ii) Hu'u

Salt broil: volume of 1.5 tons/day $\div (30\text{kg/frequency/hours} \times 8 \text{ hours/day}) = 6 \text{ units}$

Steaming: volume of 0.9 tons (because of the small amount involved, the broiler for salt broiling will be used)

Half-cooked bonito: volume of 0.7 tons/day $\times \text{estimated yield } 40\% \div (100\text{kg/pot/6hours} = 3 \text{ units}$

(b-1-2) Sales and washing

Since raw fish for processing can be sold and washed in empty spaces in the fish

handling shed, a specialized facility will not be set up here.

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

Dry racks for demonstration purposes, wooden racks (60cm x 400cm, 3 tiers), and a wooden frame net panel (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.

Soro: 12 wooden racks, 288 wooden frame net panels

Hu'u: 1 wooden rack, 24 wooden frame net panels

(b-2) Indoor processing workroom

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

Use of the facility will be assigned according to processing groups. The processing groups will be formed according to the following two methods:

(c-1) Groups made up of fishing boat crews

Almost all 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. In other words, 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 (neighborhood association) units (10-20 households per unit).

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

Trial manufacturing 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. Each 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, taste testing, 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 facility operations group. Relatively good quality products will be vacuum packed and stored in refrigerator cases 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. Proposal to Equip the Dompou Market

Even if Soro and Hu'u have landing facilities in place, as long as the market in Dompou is in poor shape, it is difficult to imagine achieving the goal of ensuring a sanitary, stable supply of fresh fish to consumers.

The wholesale market site proposed by the district government has in its favor the fact that retailers and fish traders from all landing areas can access it without going into the city. However, the following problems have been pinpointed.

- (a) Since there are few private houses in the area, and since the site is far removed from the center of town, it is not an effective location for a retail market.
- (b) At present, the majority of the fish traders and retailers at each landing site are small-scale entrepreneurs, and most of them take the fish they have acquired and retail it directly. If it becomes necessary to concentrate all the catch in this wholesale market, the fish traders and retailers will have to sell their fish at wholesale and then take another means of transportation to the retail market, which would cost a great deal in terms of both time and money.
- (c) The fish must still be sold at the existing retail markets even if the entire fish catch is collected here.
- (d) On the other hand, if there is a wholesale market, the retailers living in Dompou will not have to go to the landing area to stock up on fish. In addition, this may also encourage the women from the fishing villages to form marketing groups, since the existing small-scale fish collectors have high shipping costs for individual retailers. However, at this point, the women in the fishing villages are barely aware of the idea of shared shipping, and it will take some time for this idea to be realized.
- (e) At present there are 16 fish traders or retailers in Soro who are able to handle large wholesale volumes of fresh fish (100 kg/day or more), and there are none in Hu'u. Judging from the volume of fish that is shipped, it is impossible to sell more than about 30 percent of the total fresh fish catch at wholesale prices.
- (f) The district government has not reviewed any of the issues such as remodeling the wholesale market or the existing public market, or a new location for the fish market.

Based on the factors listed above, this survey has not incorporated the improvement of the Dompou market into its facilities plans, but reference materials to the district government will be provided in the form of suggestions about appropriate distribution facilities, their size, and a rough estimate of their operating costs.

(In addition, the district government should conduct a survey of the fish traders and retailers about the feasibility of developing a fish wholesale market and hold public meetings of people with the market users.)

2.3.3 Plan for Fisheries Activities Support

Facilities for improving fishery activities, including a repair workshop, oil and water supply facilities, fish net repair spaces, and retail area for fishing equipment, will be provided at each model site. As these facilities are installed, care will be taken not to compete with the activities of existing private businesses currently operating at the sites. Every attempt will be made to include them as tenants of the project.

(1) Repair 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 Dompu by each fisherman or ordered by the existing cooperative. In either case, time and cost is incurred.

This project will set up communal repair workshop where the fishermen and local repairmen of Soro and Hu'u can repair fishing boat engines. This workshop will not be used only for engine repairs, but also for making improved drying boards for processing and a woodworking area for making reinforced frames for insulated boxes to use in marketing fresh fish. Except in Soro, where the existing fishermen's cooperatives already conduct purchasing activities, a fishing gear and equipment shop will be provided in Hu'u, to make it more convenient for the fisherman to acquire materials.

(2) Fuel Facilities

In both Soro and Hu'u, local private fuel shops procure and sell fuel. There are plans to provide landing facilities and/or fish handling shed at the fish landing site. Considering the conveniences of the fuel supply to fishing boats, a fuel supply facility is to be provided inside these sites. However, the fuel sales method is to be taken in to consideration whether to be given to a tenant or to be managed by the fishermen organization. The fuel supply volume per day during the peak fishing season and the supply patterns are shown in the table below.

1) Soro

Type of fishing boat	No. of boats in port per day	Avg. amount required/boat (liters/boat/day)			Amount of fuel supplied per day		
		Diesel	Gasoline	Kerosene	Diesel	Gasoline	Kerosene
Bagan	31.3	40	0	0	1,253	0	0
Purse seiners	10.0	15	0	20	150	0	200
Gill net, line	10.1	10	0	0	101	0	0
Collection boat	40.0	10	0	0	400	0	0
Total	91.4				1,903	0	200

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 Dompu city that will ensure fuel is supplied regularly to this district (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. A tenant will be recruited from among the existing fuel retailers or a joint management of the facility with an existing fuel retailer will be set up. However, if none of the retailers are interested in operating the facility, it will be managed directly by the fishermen's cooperative (Koperasi Mina Uni).

Pertamina's oil supply can be assumed to be one tank truck full (5 KL) per trip, and since these supply trips would be every three days, ($5\text{KL} \div 1,903\text{L} = 2.6$), one 5kl Diesel tank will be installed. Since the daily demand for kerosene is small, it could be supplied in drums, so 3 drum canisters ($200\text{L/day} \times 3 \text{ days' supply} \div 200\text{L/each}$) and hand pumps will be installed. Note that there is a possibility of Pertamina supplying oil storage tanks and oil feeders free of charge, depending on the amount of fuel consumption. Note, however, that if the supply contract with Pertamina is not signed, a fuel depot for 28 drum canisters of diesel fuel

(1,903L/day x 3 days' supply ÷ 200L) will be provided.

2) Hu'u

Type of fishing boat	No. of boats in port per day	Avg. amount required/boat (liters/boat/day)			Amount of fuel supplied per day		
		Diesel	Gasoline	Kerosene	Diesel	Gasoline	Kerosene
Purse seiners	12.0	15	0	0	180	0	0
Gill net	3.0	10	0	2	30	0	6
Trawlers	6.0	5	0	3	30	0	18
Total	21.0				240	0	24

Since the daily fuel consumption in Hu'u is small, a fuel depot will be set up on the lot inside the facility for 5 drum canisters (4 drums of diesel, 1 of kerosene). A tenant for this facility will be recruited from among the existing fuel retailers, but if there are no candidates, the fuel depot will be managed by the existing fishermen's cooperative (Koperasi Mange Colu).

(3) Water Supply Facilities

Water supplies are necessary for sanitary handling of the catch and for guaranteeing quality. Since there are no catch processing facilities at either Soro or Hu'u, water is not used from the time the catch is landed till the time it is shipped to the market. This means that the catch is inevitably handed in unsanitary conditions, and deterioration in freshness and quality are evident.

For this reason, water supply facilities will be set up to support improvements in freshness and quality and to ensure that the catch is handled under minimum sanitary conditions. Based on the work patterns from landing to shipping and retailing at each site, the water usage and the types of water that will be used are as follows.

Uses and Types of Water Supplies			
Use	At both sites	Target water use	Actual water used
(i) For washing the catch	yes	Fresh water, sea water	Sea water
(ii) For processing fish products	yes	Fresh water, sea water	Sea water, fresh water at the model processing site
(iii) Supply for boats	yes	Fresh water	Fresh water
(iv) For making ice	yes	Fresh water	Fresh water
(v) For cleaning facilities and equipment	yes	Fresh water, sea water	Sea water
(vi) For sanitary facilities	yes	Fresh water	Fresh water

Calculated on the basis of the methods in Appendix 4, the required water volume is estimated as shown below. (For details about the criteria that were used to calculate the required water volume and basic unit, please see Appendix 4, Table 4-1-6, Water Supplies and Water Storage Facilities.) Water used in fisheries differs greatly according to use, sharp fluctuations in water supply patterns occur, and may cause water shortages at peak demand times. For this reason, a one-day supply of fresh water will be stored to ensure that the required amount of water is available at all times.

Use	Water Supply by Use			
	Soro		Hu'u	
	Water requirement	Water used	Water requirement	Water used
For washing the catch	6.7m ³ /day	Sea water	0.9m ³ / day	Sea water
For processing and preprocessing fish products	5.3 m ³ / day	Sea water, fresh water at the model processing site	0.8 m ³ / day	Sea water, fresh water at the model processing site
Supply for boats	3.7 m ³ / day	Fresh water	1.1 m ³ / day	Fresh water
For making ice	4.2 m ³ / day	Fresh water	1.2 m ³ / day	Fresh water
For cleaning facilities and equipment	5.4 m ³ / day	Sea water	1.2m ³ / day	Sea water
For sanitary facilities	2.9 m ³ / day	Fresh water	1.0m ³ / day	Fresh water
Requirements for fresh water	16.1 m ³ / day	-	3.9m ³ / day	-
Water storage capacity	16m ³	-	4m ³	-

Note: See Appendix 4, Table 4-1-6, Water Supplies and Water Storage Facilities

(4) Equipment Drying Area and Outdoor Storage Space

Since Soro and Hu'u are sub-villages that 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.

For this reason, equipment drying areas, where fishermen may clean, dry, and repair their equipment and nets, will be built. 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.

- To provide added temporary space for cutting or processing activities.
- To store fishing equipment temporarily before setting out or during rest periods
- To store cutting instruments.
- To store fishing nets and ropes, as well as fish boxes and other fishing materials

The required area is estimated to be as follows. (See Table 4-1-9, Appendix 4, Equipment Drying Area and Outdoor Storage).

Equipment Drying Area and Outdoor Storage Space						
Type of space	Use	Required space per roofed spaces	Soro		Hu'u	
			Number of roofed spaces required	Required area	Number of roofed spaces required	Required area
Equipment drying area	Drying area for purse seine fishing	330m ²	2	660m ²	2	660m ²
	Drying area for gill net fishing	75m ²	2	150m ²	1	80m ²
	Subtotal	-	-	810m ²	-	740m ²
Outdoor storage space	Multi-purpose space	10m ²	23	230m ²	4	40m ²
Total	-	-	-	1,040m ²	-	780m ²

Note: At the Hu'u site, the fishermen houses are scattered around a wide area, and some of the households that are far from the model site anchor their fishing boats off the beach in front of the village. Since fishermen do their repair work in their own yards, nearly half the purse seine fishermen do their maintenance and repair tasks at home. It is assumed that the fishermen households will use the outdoor storage space on the days when they do not go out fishing (5 days per month).

2.3.4 Plan for Mariculture

Beginning this fiscal year, the NTB Provincial Fisheries Office and the Dompu District Fisheries Office began trial projects in floating cage culture of groupers and similar species in Saleh Bay. Saleh Bay is a wide expanse, and its waters are believed to be appropriate for mariculture, but with large, active fishing activities already in place, there is an underlying need for a system of laws that will govern the appropriate use of the waters for fishing and mariculture. Moreover, this bay has only a few small rivers flowing into it in proportion to its size. Thus, a full understanding of hydraulics and water quality characteristics of the bay is needed to ensure its appropriate use. However, at this point, the necessary information has not been collected.

According to the District Fisheries Office, the participants in the trial project have already completed their training, and the plan is to distribute fish cages to individuals as a first investment, but other than a subsidy for fish food, the burdens of expenses for administration, maintenance, and management will all be borne by the individual. Unlike seaweed culture, the fish can not be harvested for a year and a half, and there is a need for administrative guidance, as well as funding. The objective of the project is to assist the government's mariculture project, and to collect data about the characteristics of the waters of Saleh Bay.

(1) Plan for Improving Cage Culture Technology

In order to improve the provincial and district government culture project of groupers, a project in Saleh Bay will be implemented that will serve as a natural environment survey and a model mariculture project for demonstration purposes. By implementing this project, the natural and social conditions and fishery conditions in Saleh Bay will be studied and cultivation methods that are suited to the environment will be introduced. Once introduced, the technology will be extended to other mariculture projects that are being implemented in nearby waters.

[Project Purpose]

One of the grouper culture projects being implemented in Saleh Bay will be selected as a model cage cultivation activity that can be introduced in the zone.

[Results]

In order to fulfill the objectives of the plan, the following achievements are required.

- Transparency of project administrative expenses and guaranteed incomes for participants. Please see the plans for cage cultivation technology in the Eastern Flores District.
- Technology transfer of suitable cultivation technology. Please see the plans for cage cultivation technology in the Eastern Flores District.
- Creation of a model for mariculture operations

In Saleh Bay, there is already an established industry that ships natural groupers out as live fish. In order to avoid competition with these existing fisheries, artificial breeding activities of humpback grouper will be conducted to develop mariculture in Saleh Bay. However, natural fry will be cultured during the initial fiscal year and the culture of humpback grouper will be conducted from the second year.

Three surface areas of cages will be used, and about 2,000 fry will be cultured at one time.

[Content of the Activities)

Fishermen will be the main participants in this project, but as in East Flores District, there will be some assistance from the District Fisheries Office and the Lombok Mariculture Station for part of the activities (see East Flores District).

(2) Survey of Hydraulics and Water Quality on the Eastern Shore of Saleh Bay

In conjunction with the mariculture project, hydraulics and water quality along the eastern shore of Saleh Bay will be monitored over a period of ten months (including the dry season, rainy season, and the northwest monsoon) in order to get a better idea of the bay's characteristics. This information and existing sounding charts will serve as the basis for the provisional designation of the waters most suited for mariculture.

(3) Plan for Using Waters for Fisheries and Mariculture (draft)

In conjunction with the activities described in (1) and (2), the scope of the existing fisheries activities in the bay according to fishing method (especially Bagan fishing) will be studied. A workshop will be held with the fishermen to select the water area that is the most suited for cage culture. Based on the information that is obtained, a water usage plan (draft) will be formulated.

2.3.5 Plan for Fishing Village Environment

On the basis of the development concept outlined in 2.2, a social environment improvement project, aimed at improving the infrastructure to mitigate the harmful effects on fishing activities in both Soro and Hu'u, and strengthening the residents' self-motivation for community improvements will be planned.

(1) Project to Improve Fishing Village Infrastructure

1) Soro Site

The biggest problem in Soro is insufficient water. This has led to water pollution and the overflow of garbage into the sea, which degrades the fishing environment. Since improvement of the village's entire infrastructure is not the original objective of this plan, it will not be included in the project. Therefore, a model facility that the residents can use to implement future improvements to alleviate their water shortage will be provided.

Moreover, since throwing trash into the sea also degrades the fishing environment, a trash collection system is planned. There are no major problems with village roads and drainage, so it has not been included in the project.

A. Model Water Supply and Toilet Facility

(a) A model water supply and toilet facility will be provided to show the residents a means of improving the sanitation of their sub-village, and raise their awareness of sanitation issues.

(b) Nature of the Facility Provided, Operating Procedures

One model facility combining a deep well and a traditional kamar mandi (combination toilet and bathing area, one each for men and women, ceiling, enclosure, and water supply and drainage systems) will be built in each of three Dusun (sub-villages) in the village.

(c) Maintenance and Management Procedures

The village residents will decide how the kamar mandi will be used. Basically, the village will manage it. Charging a small, uniform fee to residents who want to use the facility

will cover maintenance and management; these fees will be deposited in a bank and will be used to cover expenses for maintenance and management.

(d) **Benefits Derived from the Facility**

By using a sanitary water supply and toilet facility, the residents will raise their awareness of sanitation. Having been shown a means of improving sanitation, the villagers will be increasingly motivated to improved sanitary conditions in the village as a whole.

B. Trash Collection Project

(a) **Objectives**

A trash disposal system will be created in the village to improve its sanitary environment. By introducing a self-help system of trash disposal, the residents' awareness about participating in environmental improvements in the village will be promoted.

(b) **Nature of the Project, Operating Procedures**

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. Since the village is comprised of 1,100 households, 110 garbage boxes will be provided. The location of the garbage disposal site and how the collected garbage will be disposed of (incinerate or buried) will be decided at the village meeting. The garbage will be transported to the garbage site by horse drawn cart (benhur).

(c) **Maintenance and Management Procedures**

Every two days, trash will be moved from the collection container by a KPP unit according to a duty roster and put on a benhur for transfer. The benhur transport fees (about Rp. 4,000 roundtrip) will be paid for by donations from the villagers.

(d) **Benefits Derived from the Activity**

There will no longer be trash discarded along the beach, and the sanitary environment of the shoreline will improve. The project will also raise the residents' awareness of participating in environmental improvements in the village.

2) **Hu'u Site**

No infrastructure improvement plans are proposed for the Hu'u site for the following reasons.

(a) **Water Supply Problems**

Hu'u's water supply problems are due to the inability of the residents to pay the water fees or to be hooked up to the water main. Any water shortages that exist are not due to a lack of water sources.

(b) **Problems with Human Waste and Trash in the Ocean**

Although the residents relieve themselves and throw trash into the sea, the beach where the catch is landed is far from the village, so these actions do not directly degrade the fishery environment. Therefore, it is believed that they can be dealt with by strengthening the community's motivation to improve the village environment as explained in the section on Project to Raise Awareness about Improving the Social Environment of the Village.

(2) Project to Raise Awareness about Improving the Social Environment of the Village

This project will be designated as a communal priority district project. For details on the content of the project, see V-1 Bima Priority District, chapter 2.3.4 Plan for Fishing Village Environment.

2.3.6 Plan for Fishermen Organization and Fisheries Extension

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

(I) Plan for fishermen organization

1) Background and Rationale

Soro and Hu'u are the two model sites in Dompu priority zone and the development programmes planned for these model sites 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 and aquaculture activities. The scope and scale of planned facilities and equipment will depend on the needs of the fishermen. These two model sites will strive to establish a mutual cooperation between them in terms of sharing information, etc.

The fishermen and the existing cooperatives will play a positive role for the operation and management of the planned programmes in both Soro and Hu'u.

There is presently one active cooperative (KUD Mina Uni) in Soro, and a newly formed fisherman cooperative (Koperasi Nelayan Mange Colu) in Hu'u, which has not started any activity.

Although the existing cooperative in Soro provides small credits and services (purchase/sales of kerosene and diesel) to member fishermen, the management of the planned facilities and equipment cannot be entrusted to them; the participants in the workshop disapproved using the existing cooperative because it not well organized and managed and its activities are restricted despite its long history.

In case of the newly formed fishermen cooperative in Hu'u, it is still in its infancy stage and has not commenced any activity. Subsequently, it is necessary to form a new fishermen management organization in each site.

2) Proposed fishermen organization for project management

These proposed organizations in both Soro and Hu'u will be appropriately represented by the fishing communities and fishermen to ensure the selection of board members, the decision making process, the operation of activities, and other matters concerning the management of the planned projects are conducted fairly and smoothly according to the wishes of the members. In addition, the role of the provincial and district fisheries offices and village administration is equally important as a source of necessary technical and financial assistance for data collection, resources management, marketing information, maintenance of facilities, credit fund (PEMP, P4K, etc.) and access to education/training and extension services.

The management system will be implemented to be in two stages; the first five-year stage and second five-year stage. The planned programmes are new for the model sites; therefore, during the first stage of management and operation by the proposed fishermen organization, appropriate extension training, OJT, guidance and supervision by DFO and village administration must be provided in order to prepare the organization to a viable and self-reliant. At a later stage it is expected that the management organization will have developed and strengthened through the activities and extension/training imparted in the initial stage to become an independent and self-reliant.

The proposed fishermen organization for project management in the two model sites in Soro and Hu'u are as follows.

(a) Soro

As the existing cooperative does not have sufficient capability for operation and management of the planned programmes, the proposed fishermen organization for project management in Soro model site will have a board of directors composed of representatives of the existing cooperative, fishing villages and a technical advisor from the fisheries office. The details of the organizational structure and its functions are explained in Section 2.5.1. It is expected that the organization will conduct its activities in a cooperative spirit.

After five years of implementation, the organization should have a viable and active organization, and have adequate financial base. With this achievement, it should become a cooperative or an association that represents member interests, has strong bargaining power and can utilize institutional credit funds and government services.

(b) Hu'u

As the existing newly formed fishermen cooperative does not have enough experience in project management, the proposed fishermen organization for project management will be a joint body with representatives of the newly of fishermen cooperative, fishing village and village administration and a technical advisor of the fisheries office. The details of the organizational structure and its functions are explained in Section 2.5.1.

Following the initial five-year implementation, it is expected that the fishermen management organization has strengthened to manage and operate the planned programmes, and gradually build up its viability and self-reliance. Education and training are planned as indicated Section 2.3.7 to sustain its achievement and self-reliance and to broaden its vision to more economic activities.

(2) Fisheries Credit

In the model sites Soro and Hu'u there are small credits for motorization by cooperative and NGO. Therefore, there is no need for a motorization plan on a short-term in this zone. However, a revolving credit scheme is necessary on a long term for motorization to diversify fishing grounds as described in Section 2.3.6 of Bima Priority Zone.

(3) Fisheries Extension

Refer to Part V-1 of Section 2.3.6 (3) in Bima Priority Zone

(4) Activity Plan

Refer to Part V-1 of Section 2.3.6 (4) in Bima Priority Zone for the plan, and the cost is detailed in Section 2.5.2 (5).

2.3.7 Plan for Education and Training

The plan is basically similar to that described in Part V-1 of Section 2.3.7 (4) in Bima Priority Zone and the cost of operation is detailed in Section 2.5.2 (6).

2.3.8 Summary of Projects in Sector Plan

The summary of projects by sectors (2.3.1 ~ 2.3.7) is shown in the following pages.

2.3.8 Summary of Projects in Sector Plan

Sector Plan	Name of Project	Project Contents	Project Site	
			Soro	Hu'u
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	Not planned	-	-
	C-2. Experiment of shell propagation and sea grass bed exploitation	Experiment of cage culture, shell propagation, mangrove reforestation and sea grass bed exploitation	○	-
	C-3. Modernization / Up Sizing of Fishing Vessel	Provision of model fishing boat, and training of fishermen	○	○
	D. Project of Monitoring System of Coastal Fishing Ground			
	D-1. Set Up of Monitoring of FAD Base System against Illegal Fishing	Provision of VHF radio	○	○
	D-2. Set Up of Enforcement System against Illegal Fishing	Provision of speed boat	○	○
Plan of Landing, Handling, Shipment and Processing	A. Project of Fish Landing / Handling Improvement	Provision of fish landing facilities (Fish landing wharf, plastic containers) Provision of fish handling facilities (Fish handling space, scales)	○ ○	- ○
	B. Project of Fish Shipment Improvement			
	B-1 Ice making and storage	Provision of ice plant / storage	○	○
	B-2 Improvement of freshness	Provision of cool box and storage space	○	○
	B-3 Improvement of communication	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	Provision of fish processing facilities (space for cutting, and washing, improved kern and dry stall, processing room, etc.	○	○
	D-2. Pilot Test / training for Extension of Fish Processing Technology	Technical assistance of technology improvement and extension activities	○	○

Sector Plan	Name of Project	Project Contents	Project Site	
			Soro	Hu'u
Plan of Fishery Activities Support	Workshop and multipurpose building	Provision of workshop, fuel supply and water supply facilities, space for net repair and stock yard	o	o
Plan of Aquaculture	A. Project of cage culture technology Improvement	Technical assistance for establishing model cage culture system, formulation of draft special plan of marine aquaculture area based on results of preliminary scientific survey	o	-
Plan of Community Environmental Improvement	A. Project of Community Infrastructure Improvement			
	A-1. Model Water Supply / Toilet	Provision of model bath (kamar-mandi) with water supply / drainage	o	-
	A-2. Garbage Collection System	Provision of garbage bin and extension activities of collection system	o	-
	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	Technical assistance for making education materials and its guidance, and provision of necessary equipment (Umbrella under Provincial Dinas Perikanan)	o	o
	B-2. Provision of Equipment for Community Improvement Education Support	Provision of vehicle and audio visual equipment for extension of community improvement (Umbrella under Provincial Dinas Perikanan)	o	o
		Technical assistance	o	o
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.	o	o
Plan of Fishermen Education / Training		Education/training for strengthening of capability of fishermen leaders and fishery extension staff, and for supplementary technical knowledge	o	o